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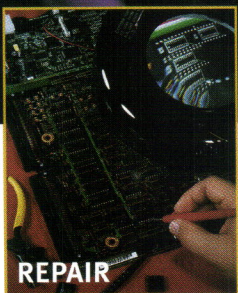
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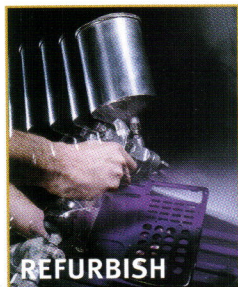
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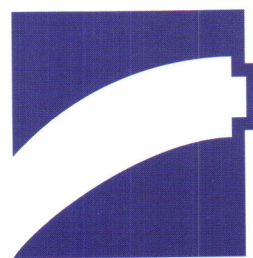
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Leadership must have the
courage to have no small
dreams.

—Ray Steele, PhD
Ball State University
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The ACUTA Journal

of Telecommunications in Higher Education

Published Quarterly by
THE ASSOCIATION FOR TELECOMMUNICATIONS PROFESSIONALS IN HIGHER EDUCATION
152 W. Zandale Dr., Suite 200, Lexington, KY 40503-2486

Phone: 859/278-3338
Fax: 859/278-3268
E-mail: pscott@acuta.org

Publisher, Jeri A. Semer, CAE, ACUTA Executive Director
Editor-in-Chief, Pat Scott, ACUTA Communications Manager
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Advertising Sales, KCS Intl. Inc., phone 717/397-7100. KarenKCS@aol.com

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ISSN 1097-8658

POSTMASTER send all address changes to
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ACUTA WORLD WIDE WEB SITE: <http://www.acuta.org>

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Anthony R. Tanzi, RCDD
Brown University
ACUTA President
2000-2001

President's Message

Addressing the Campuswide Information Architecture

For more than a decade, a key Brown University goal has been to facilitate the integration of technology in teaching, research, and administration by creating an environment that demonstrates its value and facilitates adoption of appropriate technology.

The University has undertaken to provide all members with access to powerful information technology and appropriate support services. It has focused on ensuring a base level of services and resources for everyone.

As a result, resources have been devoted to providing universal desktop access to a robust network; operational systems for the core administrative functions; a library of software for communications, personal productivity, instruction, and research; and training and technical support on these base services.

The University's current computing environment reflects attention to infrastructure and a common communications environment. A fiber optic backbone links every building to the campus network, and high-speed connections link the campus to the Internet.

Faculty members and staff involved in knowledge work have computers on their desks. Students in campus residence halls can link

their personal computers to the campus network. Computing clusters ensure a common instructional environment and equitable access for all students, whether they have personal computers or not.

Faculty, staff, and students alike can use electronic mail, on-line library catalog searches, electronic bulletin boards, and other services that increase access to information and speed the process of information exchange.

In addition to central services, Brown has a highly distributed computing environment.

Individuals and departments have brought in information technology beyond the base services, not only in research and scholarship but also in administrative departments whose needs fall outside the major operational systems. Departments have become increasingly independent in planning, implementing, and supporting computing to meet their information and communications needs.

The University's commitment to universal and ubiquitous access to a base level of services has demonstrated the value and potential of information technology.

The challenge now is to deliver on the promise of connectivity. With increased connectivity come new challenges: data ownership, privacy

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President's Message

continued from page 4

issues, and standards for data collection, updating, and dissemination. With increasing choices in technology, users need help selecting the tools and systems that enhance their education, research, or administrative function while coexisting with other campus systems. People need training in the most effective use of their new tools, and they need resources that will encourage the use of computers in non-traditional methods.

Like other institutions of higher education, Brown University is challenged to develop a campus information technology plan that addresses campuswide information architecture rather than just campuswide information technology services.

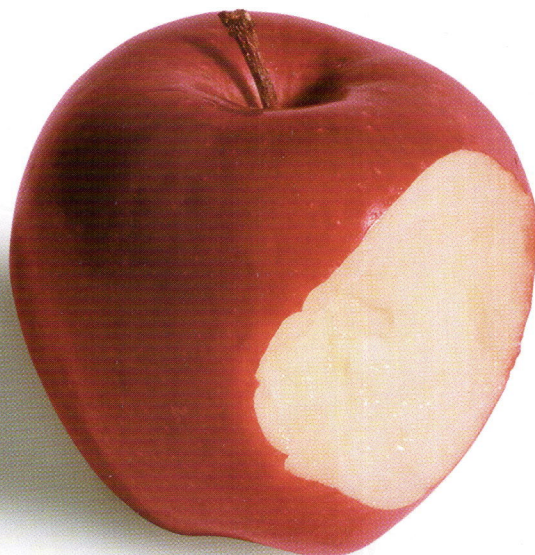
We are also challenged to keep pace with faculty, student, and staff expectations for a rich information technology environment for teaching, learning, and the basic conduct of University business.

I hope these thoughts put things into a clearer perspective and the articles in this edition of the ACUTA Journal help us all better plan our vision and implementation for what is a fundamental part of our jobs—supporting academic services.

The source of the material used in this article is the Computing and Information Services section of the current Trustees' Handbook of Brown University.



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Supporting the Technology-Enabled Classroom

New technologies are enabling educators to communicate and connect with students in ways even Buck Rogers and Dick Tracy probably never dreamed of. "Smart" classrooms offer multimedia capability, laptops for every student, Internet connections at the desktop, electronic whiteboard technologies, and more, changing the way education is delivered in the 21st century. For those who support the technologies, the opportunities—and the challenges—are tremendous.

by Curt Harler
Contributing Editor

Larry Latman, a professor of geology at Penn State University, used to forbid students to take notes in class. Instead, he encouraged his students to listen to him and to look at the material he was presenting, not to be distracted by writing.

"When there is something that I want you to write down, I'll let you know," he'd say. His method worked. Retention rates were high, and Latman was cited as an outstanding professor on campus.

That was in the late 1960s. On some campuses today, students don't have to take notes at all, even if the professor wants them to have those notes or diagrams. They simply

download what the professor has drawn on the classroom whiteboard to their laptops and pour over those notes back in their dorm rooms.

A former teacher, Barbara Brandt, educational analyst at Emory University, Atlanta, Georgia, says, "The one thing you don't want to see is a room full of students with their heads down taking notes." At Emory they use the Smart Board from Smart Technologies Inc., Calgary, Alberta, Canada (www.smarttech.com), to keep students' heads up—both literally and figuratively. The program works, Brandt says. It works at other schools, too.

McGill University, Montreal, Quebec, is also implementing whiteboard capture technology as part of an overall package which includes digitized video and other enhancements. "This lets the students watch while a lecturer does an experiment, rather than scribbling notes frantically," says Gary Bernstein, director of computing and telecommunications at McGill.

Schools ranging from McGill to Emory to the Georgia Institute of Technology (Georgia Tech) all have implemented whiteboard technology, and it seems to be a hit wherever it is used.

Two Projects at McGill

McGill actually has two initiatives under way. The first is called the Electronic Classroom Project, a University-wide infrastructure project that will provide every major classroom with what Bernstein terms "prosaic and mundane" multimedia capability. Included on the list are a network connection, a podium with a laptop connection, an LCD projector, and a phone with pre-programmed speed-dial capability to

allow teachers to reach key contacts such as the audiovisual department for assistance, or to call campus security in an emergency. Dozens of classrooms have already been outfitted with the technology.

The Smart Classroom at McGill is a single room equipped with all manner of high-tech enhancements. "Everything in the room is controlled in response to what the lecturer does," Bernstein says. For example, if the instructor puts a document on a document projector, the blinds in the room close, the lights dim, a movie screen comes down, and the document is projected for students to see. A smart whiteboard electronically captures everything the professor writes on the board. Everything the instructor does is captured on video that is digitized.

Following the lecture, the lecturer's notes are published on a Web site. "Students can then search the notes and see a video clip at the same time they listen to the instructor," Bernstein explains.

The Smart Classroom is sponsored by several multimedia firms and is driven by Professor Jeremy Cooperstock in the Department of Electrical and Computer Engineering and the Center for Intelligent Machines.

The project was coordinated by a Classroom Design Workgroup. The group coordinated the upgrade of general purpose McGill classrooms to enable the use of advanced technology in teaching. Chaired by John Roston, director of the Instructional Communications Centre (ICC), membership included representatives from each faculty and technical experts from Facilities Development, ICC, Computing Centre, Telecom, and Room Bookings.

The group developed standard facilities for the use of computers and projectors in classrooms including Internet connectivity and emergency telephones. It coordinated a centralized request for annual funding for hardware, installation, lighting modifications, and related work. The group then agreed on a priority list of classrooms to be upgraded. The actual work was done by external contractors, Facilities Development, ICC, Computing Centre, and Telecom.

During the summers of 1999 and 2000, 25 new projectors were installed in classrooms. Improvements were made to 13 of the 42 classrooms equipped previously. The total number of equipped general purpose classrooms is now 67. These do not include specific purpose classrooms assigned to a particular department or faculty.

At the same time, the number of portable projectors and laptop computers available for loan from the ICC was increased by 10 projectors and 32 computers. Of the latter, 12 are loaned for a term to groups of at least two professors who are willing to share a computer.

"Modern presentation technology has made teaching in today's classrooms increasingly complex and daunting," Cooperstock says. "Whereas 50 years ago, the only concern a professor had was running out of chalk, faculty now struggle constantly to perform relatively simple tasks, such as connecting their computer output to the projector, switching to a videotape, and even turning on the lights! Technology's capacity to improve the teaching and learning experience is evident, but so far, its potential remains largely untapped."

►

In addition to automating the device control, the classroom is wired to record a digital version of any presentation, including both the audio and video, as well as the instructor's slides and notes written during the lecture.

"The lecture capture system makes use of our presenter tracking algorithm, which follows the instructor's movements, even in front of the projected video screen, thereby obviating the need for a professional cameraman," Cooperstock says. "The recorded version of the lecture is then converted into a set of Web pages, in which every ink stroke written by the instructor is linked to the position in the video when that stroke was generated."

The only requirement of instructors is that they confirm they want the lecture recorded.

Emory University

"Our mission at Emory is to look at the classroom technology and to look at the type of teaching being done," says Brandt. "Then we try to be sure the technology they need is in the classroom." The tool of choice at Emory is the Smart Board from Smart Technologies Inc.

The firm's Smart Board is an interactive whiteboard, available in 47-, 60-, or 72-inch models, that combines the look and feel of a regular whiteboard with the power of a computer so teachers and students can collaborate on electronic documents, share information, and run multimedia materials.

Dry-erase markers are used to record notes. If a teacher changes her mind, she can use the eraser to erase what was written. But when the job is done, it is easy to save all the notes to a computer file, print them from a computer printer, e-

mail them to students, or post them as HTML files that others can view from a Web browser.

When combined with an LCD panel or projector, the Smart Board becomes a large, touch-sensitive screen. Windows or Macintosh applications are controlled by touching the board. Professors can use a finger on the board just as they would use a mouse to move between spreadsheets, word-processing documents, presentation software, CDROMs, or Web sites. Pens from the Smart Pen Tray allow writing notes over applications in

Professors can use a finger on the board just as they would use a mouse to move between spreadsheets, word-processing documents, presentation software, CD ROMs, or Web sites.

electronic ink to focus the group's attention. Then the teacher can save or print the notes to create handouts.

Two rear-projection Smarts are used in the language program. "They can teach the use of language-instruction software in the classroom," Brandt notes. In addition, they have three interconnected units being used in the psychology statistics classroom.

"Size of the board is a limitation. Instructors love to write, but unless the image is projected they are limited in what they can show," she

says. By interconnecting the units, the instructor can move from board to board.

The Information Technology Division (ITD) at Emory even uses the technology for its own sessions. Brandt notes that it is important for a speaker, moving from technology to technology, to be aware of whether the presentation is being captured or not.

Another point to be aware of is the difference in alignment of Smart Boards and other audiovisual equipment. Emory has designed a motorized lift to move the document camera and Smart unit to various heights to ensure they fill the screen.

Ramblin' the Net at Georgia Tech

A similarly ambitious program at Georgia Tech grew out of the 1996 Olympic Games in Atlanta, according to Ron Hutchins, director of engineering for the Office of Information Technology.

The implementation is the outgrowth of a project started in late 1994 called FutureNet. "It was an attempt to envision the future and build our infrastructure out to support that future," Hutchins says. The result was an impressive array of high-tech fiber-optic cable with all kinds of connections and drops that would dazzle the eye of anyone who had knowledge of technology, telecommunications, or computer networking. Unfortunately, that left about 99 percent of the world in the dark.

"I'd take them to look at the wiring closet. To them it was just a bunch of cable," Hutchins recalls. To bring the FutureNet to life, a project involving Georgia Tech's chemistry department, Zoo Atlanta, Fernbank Sciences Center (part of Atlanta's Natural History Museum), and the local Trickum Middle School was implemented. "We

worked to pull together equipment to show what the network actually could do," Hutchins recalls.

At the time, eyeball video cameras and Internet access were new and hot. So was the LiveBoard from Xerox. Students from Trickum did a project at the zoo observing animal behavior and writing papers with photos of the animals. These were posted to a Web site. "Remember, this was 1995. Parents and kids were delighted to be able to see their projects online," Hutchins says.

Other projects included a virtual tour of a virgin forest at Fernbank, a virtual gorilla that acted and responded just the way a real gorilla would act, and a fish tank at Georgia Tech that could be sampled for temperature, salinity, CO₂ content, and the like over the Internet.

"Take those pieces, put them together, and you have the class of the future," Hutchins says. It didn't take long to figure out valuable uses for college students, too. Thus was born Classroom 2000.

Gregory Abowd, in the college of computing, took ownership of the project. "We took the Xerox LiveBoard and cameras into class. Professors posted class outlines and references to the Web page. Then it kept growing," Hutchins says. Soon the professor's notes on the LiveBoard were being saved. A video was made of the class, and the video was digitized and time stamped. The video was accessible over the Net by anyone. Soon the content was linked to key words.

Today, a professor has access to three or four kinds of display, including live slides, slides on the Web page, Web access, or annotation with a laptop pen. A student can annotate the lecture notes with his own comments and store them to a central server.

Georgia Tech was able to keep much of the technology acquired for the Olympic Games in 1996. They got the fiber plant, cable TV, Category 5 copper cabling, and some TVs. The cable TV is able to run bidirectionally, with feeds into the classroom or out to remote sites. Professors can plug their laptops into a wall jack and get full Internet access. Many of the vendors gave the University discounts on equipment for Classroom 2000. There are two strands of multimode fiber to the classroom with multiple Category 5 drops. These go to each of the 40 computers in the classroom.

Not everything has been a roaring success. The cable TV, for example, sees hardly any use at all. Hutchins says he can recall only a few times when it was used.

The fiber, on the other hand, gets rave reviews. Future projects probably will focus on video conferencing as well as Web-based recording of classroom lectures.

"This has inspired the faculty to look at the way they are teaching," Brandt says. "It has inspired them to reexamine their methods." There can be little doubt that—in an age when "notebook" means computer and not a pad of paper and when Web-based education is becoming increasingly popular as schools reach out to distant audiences—the need for smart classrooms will increase.

Curt Harler is a popular author and speaker with an extensive background in telecommunications. He can be reached at curt@curtharler.com.



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RUNet 2000 Design and Implementation

by Michael R. Mundrane, PhD
Rutgers, The State University of New Jersey

The role of networking and computing at Rutgers has become increasingly vital over time. The transparent access to resources that are local to a machine, local to a network, local to the institution, or Internet based is the growing paradigm inside and outside the university and has become critical to its academic mission. This ultimately requires a ubiquitous data network infrastructure that is scalable, high bandwidth, and robust.

The university data network infrastructure, called RUNet (Rutgers University Network), was initially created to satisfy the immediate technical requirements of a very small set of faculty. Much of the early equipment and techniques were somewhat experimental, but since the network itself was extremely small in size and many of the customers were actually implementers, there were few insurmountable problems. However, over time, this infrastructure and its corresponding customer base grew dramatically until it supported 60,000+ people, 20,000+ hosts, 800+ networks, 160+ routers, 140+ buildings, 13 areas, seven campuses, four municipalities, and multiple protocols.

Neither the eventual size nor the pace of development of the data network was immediately apparent at its inception. Requirements and demands were fluid, resulting in unstructured deployment over time. In addition, funding for the effort was unpredictable. Design decisions tended to support the immediate needs of selected researchers rather than the overall needs of a broad network customer base. Ultimately, the network infrastructure became highly complex and somewhat difficult to maintain.

Time to Redesign

The RUNet 2000 project was instituted in response to the need to rebuild and enhance the university data network infrastructure. The project constitutes a complete network redesign using technologies and methodologies consistent with contemporary state-of-the-industry practices.

Although the project has a scheduled four-year deployment, the university requires upgrades to take place within a much shorter time frame in order to participate in, and take advantage of, the national Internet2 initiative. To accommodate these upgrades, Rutgers



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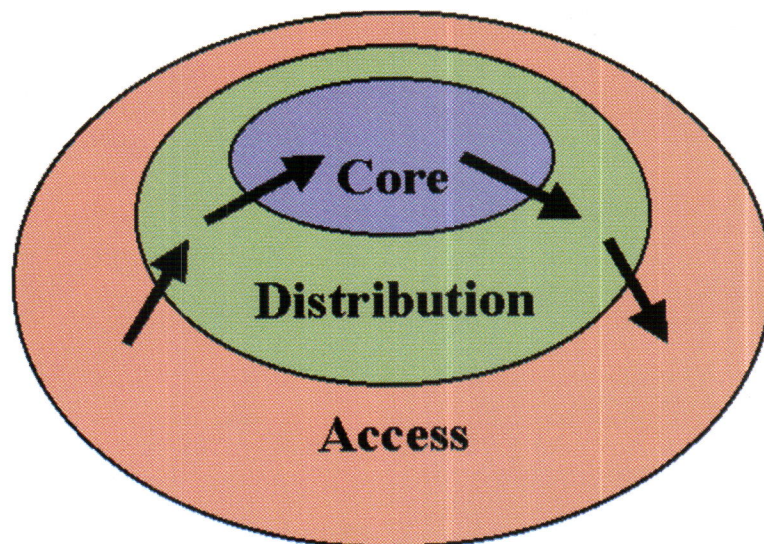


Figure 1. Data follows a logical path through access, distribution, core and back, by passing through appropriate distribution and core routers.

instituted the RUNet2 project, which applied the same techniques and principles as RUNet 2000 but utilized less sophisticated technologies and, by maximizing equipment reuse, was deployable much more rapidly. RUNet2 was completed in the early months of 2000 and provided a vastly improved university data network infrastructure to provide enhanced service while RUNet 2000 deploys.

A data network infrastructure sufficient to support the entire university community is large by necessity, but if appropriately modular, it does not have to be overly complex. By formal design, the university network is constrained to exist at the local area network (LAN), intracampus backbone, intercampus backbone, and wide area network (WAN) levels. Each of these respective levels is constructed independently with well-defined points and modalities of interaction. While each certainly exhibits some degree of internal uniformity, neither the technologies nor the specific implementation paradigms are

required to persist across respective levels.

As Easy as ABC

Starting at the bottom of the OSI protocol stack, the physical layer (L1) for RUNet 2000 consists of a three-tier fiber plant that was designed primarily to minimize trenching and conduit. There are three L1 building designations in the RUNet 2000 cabling plan: "A," "B," and "C." An A building is the root of an intracampus fiber tree that extends beneath it and also represents the termination point for intercampus fiber. The B buildings are utilized as fiber distribution sites by being directly connected to one parent A building and multiple child C buildings. The fiber plant does not extend past the C buildings. From this perspective, they are terminal locations and represent leaf nodes in an L1 graph. Within a building, the physical layer is constructed utilizing a combination of fiber and twisted pair cabling.

The first logical component of the university data network, termed the access network, consists of that

portion of the network which is entirely contained beneath a single distribution router and consists of one or more flavors of Ethernet. Most university customers refer to this as their LAN. Standard density access network switched infrastructure on RUNet 2000 is appropriately aggregated to support a 2-Mbps service level for each 10/100-Mbps port.

The second logical component of the university network is termed the distribution network or the intracampus backbone. This layer consists of that portion of the network that is entirely contained beneath one or more core routers. This infrastructure is constructed utilizing gigabit Ethernet for RUNet 2000 and fast Ethernet for RUNet2.

The third logical component of the university network is termed the core network or the intercampus backbone. This layer is constructed utilizing OC 3 and OC 12 asynchronous transfer mode (ATM) on RUNet2 and will be constructed using Cisco Systems' proprietary OC 48

Dynamic Packet Transport (DPT) on RUNet 2000. Some inter-campus links are WAN leased lines and, as such, are constrained by economic considerations to OC 3. The core ATM cloud on RUNet2 has been extended to all seven of the university campuses.

Layer-three (L3) devices or routers control all interactions between the above networks. The distribution routers separate access networks from distribution networks while the core routers separate distribution networks from the core network. Thus, each distribution router is, by definition, a direct L3 neighbor to one or more core routers. Where necessary, multiple routers were deployed to ensure that core devices and distribution devices were physically distinct. While multiple protocols are permitted on the access network, routers deployed

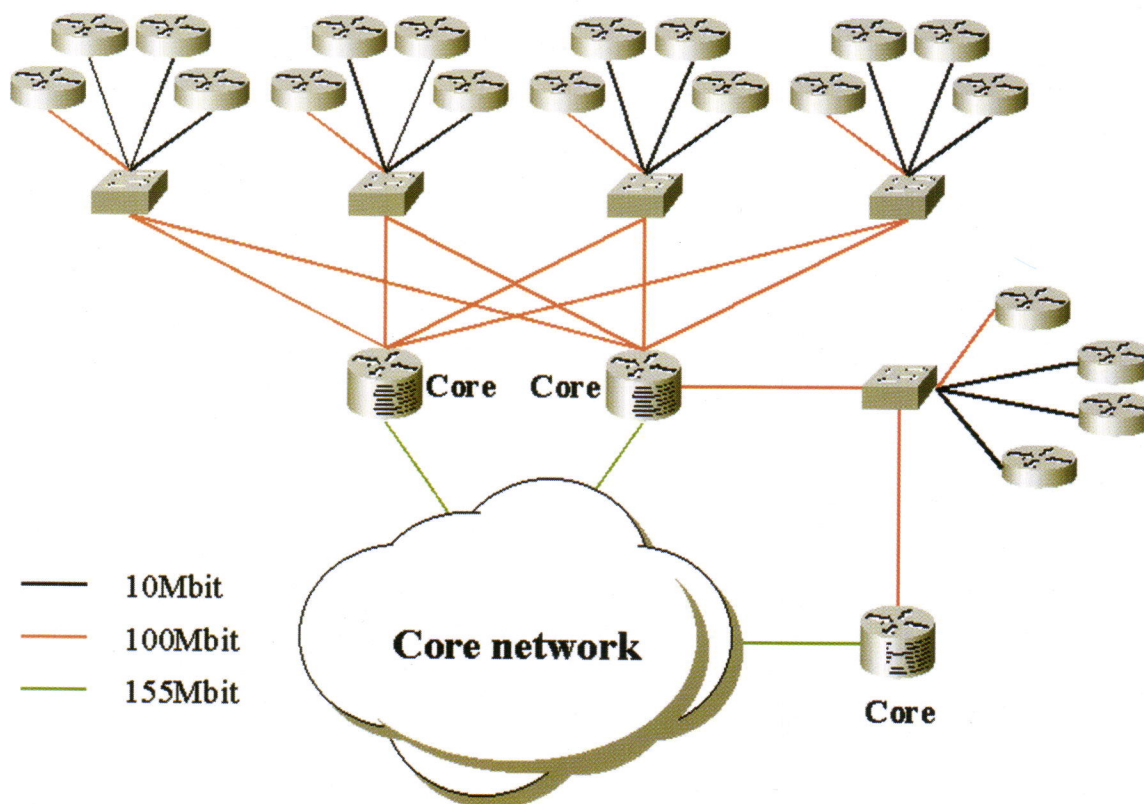
on RUNet 2000 support Internet protocol (IP) only. Thus, alternate (non-IP) protocols are constrained to remain within their originating access network.

A formal goal of the implementation model is to treat all client buildings similarly and not have network access be significantly affected by the vagaries of local geography. The consistent, modular topology imposed guarantees a comparable, deterministic path to the network core for every client, regardless of physical location. Figure 1 provides a rough depiction of this. Name and color indicate each of the respective network levels with L3 transitions denoted by arrows. Data follow a logical path through access, distribution, core, and back, by passing through appropriate distribution and core routers. This data path is independent of

customer location. Thus, the design model stipulates exactly two L3 hops between a client device and the core infrastructure, or a worst-case university L3 diameter of four hops.

This simple, shallow campus topology has the critical advantage that, by default, it imposes less delay than more complex topologies. Without necessarily committing to a latency service level, all network projects are reviewed in detail for their impact on overall campus topology. To reduce latency further, all policy enforcement was pushed to the edge of the routed infrastructure. The building distribution routers are required to enforce all access restrictions, while the core routers remain free to pass data as fast as possible. Traffic that arrives at a core router has already been suitably analyzed and approved by

Figure 2. A depiction of one of the more complex campus networks constructed under the RUNet2 project



a distribution router and, in process mode, requires only evaluation with respect to the route table before being forwarded.

The open shortest path first (OSPF) protocol is utilized across the entire routed infrastructure. The core network is defined as area zero with separate areas for distribution networks. This makes each core router an OSPF area border router (ABR). Since the number of A buildings in the fiber plan was small, it was reasonable to tie the logical network design to the physical layer by requiring that area border routers, functioning as core access routers, be located in A buildings.

A depiction of one of the more complex campus networks constructed under the RUNet2 project is shown in Figure 2. The access networking components are not indicated, but a full complement of distribution and core routers can be readily identified. Currently many distribution routers connect to the distribution network at 10 Mbps, but the redundantly connected switches are capable of supporting all 100 Mbps connections without blocking. While artistic license encourages a uniform number of distribution routers per switch, the actual numbers are all between five and nine. Fiber limitations of the legacy physical plant required three

separate core routers. The remaining campuses are similar in design, though somewhat smaller in scope.

A design goal of minimizing hardware and software variation within the RUNet 2000 project was fairly easy to achieve as all equipment could be specified and purchased centrally. The telecommunications division of the university utilizes Cisco Systems end to end wherever form, fit, and function are appropriate to its needs. This approach, while not immediately attainable on RUNet2, was nonetheless approachable over time. For example, an aggressive campaign was conducted to replace the oldest routers. The university had previously invested

RUNet 2000: Building an Information Infrastructure for the 21st Century

America's state universities play key roles in the new Age of Information. They nourish and encourage research, champion and promote teaching and learning, and advocate and practice service to and engagement with communities of many kinds. With myriad activities in such diverse areas as the preparation of the knowledge-based workforce of tomorrow, the development of Web-based learning, and the mapping of the human genome, it is clear that the growth of intellectual capital at our nation's state universities must be accompanied by the development of sophisticated telecommunications networks to support their activities.

Rutgers, The State University of New Jersey, provides a striking example of the simultaneous development of both institutional

excellence and the communications infrastructure required to advance and sustain it.

Tracing its ancestry to 1766, Rutgers is one of the oldest and most distinguished institutions of higher learning in the nation and, with some 50,000 students, is also among the largest. In 1995, the university began implementing a wide-ranging 15-year strategic plan intended to bring it into the first rank of America's public research universities. Given the ubiquitous nature of computers, the Internet, and other advanced communications technologies, it was clear to University President Francis L. Lawrence and other Rutgers officials from the earliest days of the planning process that the success of these efforts would depend significantly on the complete and rela-

tively rapid integration of information technology into every one of the university's academic and administrative endeavors.

To achieve this end, Rutgers designed and implemented RUNet 2000, a four-year, \$100 million initiative to improve and expand its existing telecommunications network and establish a comprehensive, advanced infrastructure for data, video, and voice communications. Believed to be the largest project of its kind at any American university, RUNet 2000 is taking advantage of innovative advances in networking technologies to provide high service reliability, increase bandwidth, and bring other benefits to the Rutgers faculty, students, and staff.

Through RUNet 2000, Rutgers is in the process of interconnecting 500 university buildings and

in Cisco Systems 7500-class routers, making Cisco Systems 7206 routers a convenient upgrade choice for smaller, older routers. The ability to share port adapters between these two platforms permitted a smaller spare parts inventory without compromising mean time to repair. In addition, the entire university routed infrastructure was upgraded to a common, general release version of Cisco IOS.

Conclusion

While no network is ever truly pristine, it is precisely the application of clean, textbook techniques wherever practical that results in stability and performance in the aggregate. The reconstructed

university network under the RUNet2 project shows that even a large, complex institution such as Rutgers can have a network infrastructure that is ultimately simple in any specific region. While the entirety of the network still retains some degree of complexity due to its overall size, any given location is quite comprehensible. Further, the same design paradigms and structures appear repeatedly, exhibiting very similar operating characteristics and predictable failure modes.

The net result of the RUNet2 project is a university network infrastructure that is unchanged in overall size, but is simultaneously simpler, faster, and more robust

than the network it replaced. As RUNet2 is subsequently replaced by the ongoing RUNet 2000 project, these proven techniques, implemented with significantly greater bandwidth and more precise aggregation, will provide the University community with a data network infrastructure appropriate for the next generation of applications and research.

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upgrading its network to permit high-speed data transport, interactive video transmitting, and improved voice applications. Wiring and electronics are being installed in the interiors of about 260 campus buildings to support data, video, voice, and multimedia.

Rutgers cites several benefits that will accrue from the capabilities of RUNet 2000. These include:

- RUNet 2000 will have a strong, positive impact on teaching and learning by enabling faculty and students to set up and use electronic bulletin boards, virtual laboratories, and other ways to share ideas and information more easily and rapidly.
- It will advance research and discovery by improving the ability of faculty and student scientists to communicate with each other and their colleagues, establish collaborative programs, and access information.
- It will further public service activities by providing greater and

more rapid access to Rutgers's resources for citizens, businesses, and government agencies, and also allow the university to work more broadly and effectively with the state's K-12 and higher education communities.

- In administrative areas, RUNet 2000 will enable Rutgers to streamline functions once dependent on complicated exchanges of paper and turn them into rapid electronic processes. The new network will also allow resources to be more easily shared among departments and between campuses by permitting more convenient access to central databases.

- Rutgers officials predict that RUNet 2000 will have perhaps its most dramatic impacts in the area of student life by providing data and cable TV connections to each dormitory room, suite, and public area and by giving students access to improved campus computing hubs for course assignments and the

use of other electronic information resources. Students will be able to connect laptop computers to network connections and docking stations in libraries, classroom buildings, and public locations to retrieve e-mail and use printing facilities. And this year, Rutgers is launching its own cable television network over RUNet 2000 to deliver more than 65 channels of news, public affairs, educational, entertainment, and commercial programming to the university community.

The technical design features of RUNet 2000, which are described in detail in the accompanying article, are part of a comprehensive network plan that can be adapted to changing technologies and implemented in phases with incremental funding. For more information, visit the RUNet 2000 Web site at <http://runet2000.rutgers.edu/>. Comments and questions may be directed to runet_2000@rci.rutgers.edu.

Gourmet Dining in a Fast-Food World: Change and Challenge in 21st Century Telecommunications

From a presentation by
Jose-Marie Griffiths, PhD
University of Michigan

Attendees at ACUTA's Fall Seminars in San Antonio feasted on a meaty buffet of ideas at the table of Dr. Jose-Marie Griffiths, Chief information officer and professor in the school of Information at the University of Michigan. The following is condensed from her presentation.

As professionals in information technology, we are living in a time of increasing expectations for the highest quality services and products—gourmet dining—delivered at fast-food speed and price. Higher education today serves a heterogeneous rather than a homogeneous community, providing for the needs of a very diverse student body.

How do we address this challenge? I propose that we need to shift from a focus on technology to a focus on the people who use the technology. For those of us leading technology endeavors in higher education, that means understanding our students, present and future. For those in the corporate sector, it means understanding the opportunities that colleges and universities are creating for new products as they reach out to new and different student audiences, especially through the use of technology.

It also means we have to stop thinking and talking about the amazing features of the latest technological innovation and focus on translating those features into benefits to meet specific needs.

People Changes

The first issue I believe to be of critical importance is the change in the people who are seeking to

use technology and telecommunications. College enrollment in the United States is projected to increase from 14 million in 1995 to 16 million in 2007, and perhaps to 20 million by 2010. While this population is growing, it is also changing as it increasingly includes “adult learners,” part-time students over the age of 25, 85 percent of whom juggle careers and families along with their studies.

This new demographic is mandating changes in services and how they are provided. E-government and services from business and industry are expanding as well. And for providers, there are all the challenges of dealing with convergent technologies and the need to connect seemingly disparate activities, communities and technologies into a seamless whole of robust, reliable service. Whatever our area of endeavor, the kitchen has become very crowded.

Corporations and professionals have come to accept the notion that to remain competitive they must support “lifelong learning” and continually upgrade the knowledge and skills of their employees. These students approach higher education as a commodity, and they are a highly motivated market—often not easily pleased.

Technology Changes

With personal computer prices dropping, 200 million PCs in use worldwide, and a 20% annual growth rate, computers are becoming a household appliance. Computers outsell televisions in the U.S., and by the end of 1998, approximately 80 percent of U.S. public schools were online.

It's not surprising that there are elements of all of our markets who have raced to take advantage of the potential of all this connectivity. We have seen an explosion in distance learning courses available around the world. For example, America's Learning Exchange, a U.S. Government Education Department project, now lists over 1 million online courses from over 10,000 suppliers. Tele-education Canada lists 12,000 online courses and is expanding this list by thousands each month. New York University has over 60,000 students in continuing education courses. Bellcore serves 30,000 learners annually on seven continents with their online training programs. Phoenix University, a private, for-profit online higher education provider, serves approximately 70,000 students in 12 states and Puerto Rico. These changes in technology availability and use have indeed opened up some new opportunities in the way that education can be provided and even the ways in which the educational process itself can proceed. But they all depend on having adequate connectivity between our institutions and students.

Where Are the Opportunities?

In higher ed, use of technology is expanding. According to the 1998 Campus Computing Project survey of 571 U.S. colleges and universities, in 1998, 44 percent of classes used e-mail, compared with only 8 percent just four years earlier. Over 33 percent of classes used the Internet, and more than 20 percent used the Web, compared with only 4 percent in 1994.

At the University of Michigan, in one year we had a 66 percent increase in our campus modem connect hours, and we have had to triple the number of dial-in modems in the last three years to try to keep up with demand. This is at the same time that we wired all of our dormitory residences with Ethernet connectivity, to provide those 6,000 students direct access to our network. We are one of the first universities to attach to Internet2, as well as the next stage with OC12. But we still have a significant challenge—and are feeling significant pressure—trying to get adequate bandwidth to the desktops of our professors so that they can take advantage of the capability of our backbone through broadband, cable or DSL, not to mention the pressure of our students who want that level of capability from their dorm rooms or off-campus apartments.

We are also seeing the response of technology enabling more outreach to communities by our traditional colleges and universities. At the University

of Michigan, we have innumerable projects where children in our elementary and secondary schools get to work with our "master chefs" from their school rooms. Grade school children are being taught how to use an electron scanning microscope by one of the research scientists in our Materials Engineering program. The children remotely control the microscope, collect data and interact with the scientist to analyze it, all from the computers in their own classrooms. Medical education includes a human patient simulator, a computer-controlled mannequin which reproduces all physical clues that medical staff assess to make decisions.

In our School of Social Work advanced work requires ongoing interaction with various populations, and technology makes it possible for students to maintain their existing integration with those populations while gaining the additional knowledge and skills they desire. But once again, the scope and impact of these activities is dependent on the connectivity available between our campus and those students.

Demographics and statistics from many sources suggest that distributive learning, not more "bricks-and-mortar," will play an increasingly important role in meeting the demand for post-K-12 education. In a recent National Education Association survey, 10 percent of higher ed NEA members report that they teach distance learning courses, while 90 percent report that distance learning courses are either offered or are being considered at their institutions.

The International Data Corporation estimates that in 1999 corporate-related "e-Learning" revenues were about \$1 billion. By 2003, IDC projects revenues will grow to about \$11.4 billion per year. There are similar opportunities in other telecom-related e-developments.

Broadband technology can create "virtual" universities which can effectively:

- address the desires and needs of particular student groups as well as needs raised by the demographic and lifestyle changes
- address student interests in enhancing income and vocational opportunities
- meet a growing need for mass higher education, including the need of corporations for ongoing staff training and skills updating
- provide good response to the funding limitations that will likely slow the creation or expansion of more traditional campus-based colleges

- provide students with customized learning programs, by drawing from resources at more than one institution.

At U-M we are not seeking to transform our institution into a virtual university; we are looking to technology to enhance the master/apprentice experience and, to the extent possible and desired, make the on-campus experience possible at off-campus locations. Technology has the potential to expand the opportunities available in our more traditional venues.

Traditional research universities have a responsibility to produce the next generation of faculty and researchers, those who not only share knowledge but create it. Technology can enable direct contact with the experts in the field. Students gain experience in leading-edge research techniques and methodologies and graduate with established relationships with other scholars.

Guiding Principles

At the University of Michigan, I have established a set of guiding principles relative to information technology that we use when considering any change, innovation, or acquisition. The following four principles may help you translate your assets into something that higher education leadership will understand and care about.

1. Information technology must add value to the core mission and values of the University. Except where experimentation with technology is part of the discipline, we will not focus on technology for its own sake.
2. Information Technology must draw people together, create community, rather than push or keep people apart. For example, the synergy of a student's interest and energy with a faculty member's experience and expertise, along with that student's interaction with peers, is a key component of what a large research university uniquely offers in an educational experience. We must focus on ways that technology can enhance individual interaction.
3. Information Technology must be accessible in an equitable, though not necessarily identical, manner.
4. We must balance economies of scale with our need and commitment to a diverse Information Technology environment. We must simultaneously fulfill the need for and maintain a commitment to a diverse technology environment.

With these as our guiding principles, we have then developed a technology architecture that enables us to manage and even anticipate many of the changes we are all experiencing. It is as follows:

- **Physical Infrastructure:** includes the hardware, wires, cables, backbone network, etc. necessary to provide connectivity via telephone, data networks or video.
- **Facilities and Operations:** includes major data centers such as the Data Systems Center, the new Arbor Lakes Data Facility and the University's telephone switch.
- **Middleware:** includes services which are essential to delivering information technology robustly and securely, but are largely transparent to users (e.g., security and directory services).
- **Core Applications and Services:** form the common environment of information technology services available to all University users (e.g., basic computing package, e-mail, Internet and Web connectivity, file storage and printing, computing sites, consulting, M-Pathways, etc.)
- **Specialized Applications and Services:** Includes services that meet the needs of specific communities (e.g., Dean's Partnership Program, specialized software development, Web services, demonstration and pilot projects, etc.).
- **Permeable membrane:** The four lower service layers must consistently be functional, responsive, available, and cost effective.

At U-M we have a strong focus on infrastructure, trying to get in place what we need to support the new applications that are coming down the pipeline: Backbone, wireless, high-speed community networks, convergence of voice, data and video. We know that at the pace of change and with the increased complexity and diversity of the technologies, we cannot do it all ourselves. We are looking for vendor partners more actively than ever before.

We all have users and customers who do indeed expect gourmet dining at fast-food speed and prices. I have suggested some ways to understand the changes that are happening and how we can respond to them in order to continue to foster success, both for our organizations and for ourselves personally. Times of change are stressful, but they are also times of wonderful opportunity. However, Thomas Edison once said that "opportunity is missed by most people because it is dressed in overalls and looks like work." I'm afraid the overalls and work are now left up to you to take advantage of those opportunities.

Dr. Jose-Marie Griffiths may be reached at jmgriff@umich.edu. An audio recording of the presentation from which this material is taken is streamed on the ACUTA Web site at www.acuta.org.





Interview:

Jennifer James

Cultural anthropologist Jennifer James is a specialist in the areas of cultural change, diversity, and marketing intelligence. She is widely respected as an author, television personality, lecturer, and commentator. Well known as an innovative thinker, she presents some ideas that will challenge us to think outside the box in the following interview with Walt Magnussen, ACUTA publications committee member from Texas A & M.

Jennifer James: I'd like to recommend to your group a book called *Growing Up Digital: How the Web Changes Work, Education and the Ways People Learn*, by John Seely Brown, director of the Palo Alto Research Center. He is a real technologist, and his book is about learning to think in different kinds of ways. I think he could speak better than I could to technology concerns in this digital age. But tell me what your people are most worried about. Why is this technology somehow different from, of more concern than others?

ACUTA: Our environment is changing very rapidly. Historically, we have always had separate, very distinct shops for voice and data communications. That really is no longer the case. Large-scale organizational changes are causing fear and concern, and more importantly, the half-life of technology has been

reduced to 18 to 24 months. Technology represents such a significant investment that related decisions tend to cause a lot of fear and concern: What does that do to my career?

James: In another interview with a group that's concerned with higher education, we went through some of these same issues. We concluded that the key wasn't so much whether you buy the right technology, and not whether you have the people who can stay more than a step ahead of your students.

The problem we came up with had to do with the entire structure of the institution. Let me give you some examples. One of the issues had to do with the "Net Generation," the 10-year-olds. What they love about computers is that they're not controlled by adults like television is; they're not generic like television is, they're more customized; and

they're very individual. With virtually no control at all, it's tremendously appealing.

What it does is sort of flatten the hierarchy. If you have 10-year-olds having real-time, worldwide conversations through the use of technology, being able to get information and synthesize it, etc., when they come to the university, they have no investment whatsoever in a hierarchy.

The biggest problem in dealing with this technology is the belief that someone there ought to know everything. That's the old version of "If you come to my class, I am the expert." Now that might still work in romance languages or certain history courses, but I don't see that it's going to work here. And I know this isn't very comforting to you. But basically there's no answer to your question about how do we know which technology to buy and how do we make sure we're not making



a mistake. The investment is perhaps more important in the staff or the faculty and their level of skill in information technology. Good equipment chosen by people who don't know what they're doing is not as useful as bad equipment chosen by people who really understand science and technology.

ACUTA: True. And we've always got some people who are going to oppose change regardless of what the change is, some middle-of-the-road people who can take it either way, and then a few who aggressively embrace it. Those who are leading the institution need to be those who aggressively embrace it, but how do you get more people to the right side of the bell curve?

James: In the interview I alluded to earlier, we concluded that the fastest way to get people to the right side of the curve was to eliminate tenure. I know that's not directly applicable to your situation. But at the speed at which we are moving now, if universities and colleges are to stay relevant, they cannot be patient any more with faculty and staff who cannot deal with this. There are certain areas where this is not a problem, but with regard to the implementation of these technologies, gently trying to move people is just going to get you further behind, and ultimately, universities will not be seen as places where you can get technical information.

ACUTA: Let's apply this to those who are responsible for these technologies. What are the key attributes we should look for as we hire staff?

James: Instead of hiring people from other colleges or out of vocational programs or classes in computer technology, and instead of relying on degrees, you should try to attract people from successful

computer-based businesses. Go to the cutting edge to bring people in. At least a quarter of your staff has to come from that environment to make this work. Your students are interested in the business and information world, and that's the kind of staff they need to be able to work with.

ACUTA: With the rapid advancements in technology, people are being forced to specialize in a certain area. The old days of a person being able to have a handle on the industry are gone, yet there is still a need for some people to be able to look at the big picture. In a future world of specialists, where is the "view from 30,000 feet" going to come from?

James: A good example is how medicine is handling it. They have created three layers: At the first level is the nurse specialist or physician's assistant. That's someone who can answer 75 percent of your questions. And that's someone who you've probably got on your staff already; just a good, generally savvy sort of person with expertise in a broad range of technology issues.

The next level is the general practitioner, the family physician. This is a person who can do the next 20 percent. They know a whole lot more than the physician's assistant or nurse specialist; they're a little more of a diagnostician; they authorize more expensive equipment, order tests, etc.

The last 5 percent, the one you'll rarely encounter, is the specialist. The neurosurgeon. It would be great to have a few specialists, depending on budget, in the areas that are growing the fastest or that students are most interested in. Then the rest of it is pretty basic.

So the 75 percent you already have on staff. When we talk about

the 20 percent, the ones I'm calling the general practitioner, those are the ones I'd like to see you get into the industry.

Then the 5 percent depends on the curriculum and the concerns of the particular student body or group you're trying to appeal to.

ACUTA: So maybe the kind of thing we can steal from the medical industry, since they've been using that system a lot longer than we have, is the excellent referral system. The communications flow is pretty much automatic and concise so that when it gets handed off from one level to another, there's that formalized process.

James: Yes, and they've got everything online, which means everyone can access everything. It doesn't matter where you are, you can tap into any data you might need. That combination covers the bet. You have constant new development—the 5 percent has to do that—and the rest just handles what comes down the line.

ACUTA: What should the role of higher education be in dealing with the so-called digital divide?

James: That's an important question. With the Net Generation, the 10-year-olds, research is saying that almost two-thirds of them have been on the Internet, and that all of them have played video games. So when we talk about the digital divide, about all higher ed can do, if the secondary schools aren't doing it, is have remedial courses, just like English and other subjects. When your students are coming in, or the summer before, you give them a computer/technology test just like you do for other subjects. And you hope that the public schools get better at taking care of this.

ACUTA: K-12 schools are doing a lot, but of course you don't learn everything you know at school. How does that affect the separation of the folks who do and do not have access to computers at home?

James: We're trying to get them in all the public libraries, and in Seattle we've got them in all the projects for the lowest incomes. Our biggest problem here is not providing access to computers to the kids, but providing teachers who can use them. In all of our grades we have vast numbers of teachers who cannot use a computer beyond word processing, and that is a very serious problem because they all have tenure.

The summer institutes that I've seen where a college accepts a group of students and gives them a series of tests if they suspect they are in any way marginal and then requires them to attend a summer institute before their freshman year turn out wonderful. Students learn the campus, they build up some self-esteem and self-confidence before everyone else arrives, they work on whatever remedial work they have to do, they improve their study habits. Even a course as short as three weeks has made an extraordinary difference in their first year of college. So one way to handle this digital divide is to say it's there and here's a bridge.

ACUTA: Let's talk about the Internet. What does it do? How is this changing the way people behave and work? Has research been done on this, and are these changes desirable?

James: What the Internet does is make everyone an expert. The Net Generation doesn't see themselves as crew; they see themselves as navigators. So we have kids who don't think they should sit quietly in

their classroom and be taught. They think they should be allowed to run their own show, to navigate through information sources with an occasional guide or coach. That's one thing the Internet has done. It's made a whole range of information available to virtually everyone. It's made users feel they are experts, whether they are or not. It has taught us how to seek out and synthesize huge amounts of data and created an energy that makes traditional classroom teaching tedious and boring.

[The Internet] has taught us how to seek out and synthesize huge amounts of data and created an energy that makes traditional classroom teaching tedious and boring.

The Internet really creates a different kind of brain and a different kind of learning. If you look at that book I mentioned earlier, *Growing Up Digital*, we used to think of literacy as just text, but these kids work on text and image and they call it information navigation. They don't like to be told anything, they want to discover it. It's experiential, and it's a wonderful way to learn but it's much harder to control. Their reasoning isn't just linear and deductive, it's much more triage. You look at a whole lot of other things and you make judgments.

The old method was kids who didn't know and wouldn't try. This

new thing is, "I don't know, so I'm going to link, I'm going to search, I'm going to lurk (which means moving all over the place without anyone knowing it), and I'm going to try." It's a much more constant sort of navigating kind of student who is very impatient with the traditional way of handling information.

ACUTA: When I was growing up, if something was written in a textbook, it was pretty much assumed to be fact. If it was written on paper, even newspaper, you pretty much believed it. Unfortunately, anybody has the ability to put anything they want on the Internet.

James: The result may be the opposite of what you're thinking. The first thought is, if you've got a book, it's relatively accurate. But it turns out that vast numbers of educational textbooks are not accurate. They present a politicized view of history. Growing up, we believed it was true. But even if you're an absolute conservative, vast amounts of information in those textbooks are wrong.

The other problem is, whether it's math or biology, textbooks can't keep up. Material is changing so fast that you end up teaching something you have to unteach the following year. The Internet certainly has a lot of misinformation and a lot of crude stuff. That stuff is always available in print in one way or another.

What you and I care about is substance and accuracy. Now the advantage for this new generation is that they are skeptics. They are cynical. They don't think we told them the truth. They see certain things in the world with the arrogance of youth, and they are going to question accuracy. The vast majority of the young people using

the Internet are becoming very sophisticated in their ability to discern truth.

I'll give you some examples. I worked with Pepsico, and I told them not to put an ad in their text. If you're putting out a game or some information and want kids to think your site has something for them, if you want to include an ad for one of your soft drinks, you have to identify it as an ad. Put a box around it, give it a different color, give it a big asterisk. Companies that don't do this get unbelievable hits from kids when their site goes up telling them they aren't coming back until they stop trying to fool them.

So I'm not worried about the ability of these Internet users to discern good information from bad. I'm much more concerned about traditional, established regulars like you and me being able to discern it because we're so captured by form. We don't question a whole range of things because it's in the newspaper or in a book. That's the way we were raised.

ACUTA: That's true. There are some big generational divides.

Here's another question, sort of related to the differences in our generations. In the future, our primary marketable commodity may be our knowledge base. We will be selling what we know. Will protecting our assets be a challenge in a society that takes great pride in their ability to share pirated music?

James: I think there's going to be a lot of discussion about how you define intellectual property. Music is fine and literature is fine, and everyone agrees that that is intellectual property and it needs to be protected. But a whole range of things they're trying to patent and control will eventually fail because there is a commitment—not to

pirating, which I think generally people would agree is wrong—to resist control over knowledge. And when you say that your primary marketable commodity is this knowledge base, do you mean that as your ability to think in the future, such as your intelligence, or your control over the information you have at any given point?

ACUTA: I think it's the former. Let's say I bring in a consultant. What I'm looking for that consultant to do is to think of things in different terms than I can, to bring additional value to the table as far as where the industry and the technology are going.

James: That's a perfect way to put it, because what Generation X and the Net Generation seem to care about, what they're willing to pay for and put time into are the things that help them think better. So an individual who can show them alternatives, who can help them use their brains better, turns out to be far more useful to them than someone who can just give them information. It's because there's that little bit of arrogance, well, I could get information anywhere. So it's very important that the primary marketable commodity is going to be not your ability to think now but your ability to think five minutes from now and a year from now.

ACUTA: One reason why this is so timely at the university is that the biggest application that the university tends to be fighting right now is Napster, which lets them very easily share MP3 audio files with each other—take the music, digitize it, and use the Internet to disperse it.

James: Yes, and apparently the quality of sound even improves, over the computer. We didn't worry about it for a long time because the sound was "tinny." Yes, the music industry has to fight that. But let's

apply this thinking to the Internet University. When I look at the research, what everybody seems to want is less time on campus. You will not be able to protect university intellectual property.

There's a movement now to stop high school at the end of the sophomore year because the junior and senior years are just sort of irrelevant. With all that testosterone running around, everyone just gets into trouble. Some people feel we should convert campuses into junior and senior year of high school plus freshman and sophomore year of college. Then the junior and senior year of college would be spent off campus.

Nobody wants to be captured on campus for four years. They want a whole range of this sort of thing where they might take some of their courses in an Internet University, and any university that offered a class would be paid for it. They want to spend some time on campus but in small classes of no more than 40 that's a real seminar or conversation with a professor where they can actually have a sort of equalitarian exchange. They don't want to sit in 500-student classes and be fed information. They can do that on the Internet.

So it's wanting the best of the university—the dialog, the problem-solving, the access to good minds, the social contacts—and not wanting the worst of the university—the torturous search for information in the library and the huge, boring lecture halls with someone who is taking forever to give you information that you're used to getting much more quickly.

I think you're going to end up with younger students who spend less time on campus. Look at our kids. We think in many ways they're

not maturing, but in other ways they're maturing at such a level that virtually a third of the 16-year-olds could do fine as freshmen in college. And a whole lot of new educational theory is backing that up.

ACUTA: And yet we keep hearing about the new demographics and how we will see the average student age increase, not decrease.

James: You're going to have both. The age of students will range from 16 to 80. The very nature of the campus social structure—geared right now to a 1950s beer bash—makes it difficult for the older students, scary for the younger students, and creates a sort of social time warp. It's going to fall apart.

While the concept of eliminating the last two years of high school may seem radical, if you look at the junior and senior years, where so many kids these days spend so little time, say two or three hours, in class, you see this is a normal growth of the way we handle education. It's part of a trend, and it will continue, whether it's older people wanting to return to school or younger people wanting to learn more and learn it faster.

The campus is never going to lose out to the Internet. People are always going to want all the things a campus gives, but it is absolutely time to mature the campus so it's less a socializing process, even though that's an important element. Building bonfires and going to football games can always be part of it. But much more than that, it's a way to develop your mind and your life, particularly in an international or global context.

Often colleges will say to me, "But we still have all these kids who need remedial." You'll always have those, but we're going to see such a

huge increase in the number of 16-year-olds that are way beyond the average campus that that is the direction of growth. You must serve the increasingly intelligent navigators who can hold their own lives together at a much earlier age.

ACUTA: Do you think that's because of the Internet?

James: It's because of many things: parents taking more interest, public education is finally beginning to catch up, and the Internet makes all things available to these kids and most of them use it well. And the decline in sports or marriage being the be-all and end-all in schools. The decline in the right fraternity being the way you get into the right New York law firm. When you flatten the hierarchy, when the CEO looks the same as the janitor when they're standing at the latte stand, when the peasants begin to read, the king begins to look stupid. It's the American Revolution and democracy continuing, which is as more and more people on the bottom rungs have more and more information, they're unwilling to put up with bad practices from the elite.

What that means is that professors lose prestige unless they are equalitarian and competent. Institutions lose prestige, and people say, "I want substance, not an old school tie. If you can't give me substance, then no amount of your prestige is going to entice me to spend four years." At the same time, remember, their parents are still on the prestige bandwagon and the kids will have to argue with them. When Harvard, in the 1950s, instead of just letting in the elite's kids, went to aptitude testing and intelligence testing, that was an extraordinary statement, very American. That said you will be allowed into this school on the basis

of ability. That trend is going to change the substance of what we're able to offer and market to this generation.

ACUTA: How do you see the role of telecom directors on campus fitting into the scenario you're describing? Is there anything you can recommend to our people specifically that will help them prepare their campuses for this or to help themselves adjust?

James: Two things. Relationships, relationships, relationships. That's the first one, because people are scared and they want a bond with an individual that will let them push and ask and stretch. That constant turnover just means you kind of give up. It's like dating a new person every night. So if there's any way, form a relationship, maybe around an empowered team concept, so that there's some consistency and constancy.

The second thing is information provided in small, concise ways. No big color brochures. Regular updates about the technology, what's available, and its relevant pricing. Comparisons, so they don't have to do it themselves, with other telecommunications. Just be honest. This one has that, but we can give you this. Let's work on a combination. If they feel that you have superb information that's very timely, presented in a very honest way, instead of "let me sell you this piece of junk that you won't need in a year," then people will stay with you for life. But remember they are cynical, anxious, and they don't know what they're doing. They really feel pushed, and they love to have a specialist who will take some of that load off. And you can't do it with just a brand name any more, particularly to Generation X.



Organizing the Technology Leadership Function for Universities in the Early 21st Century

After 30 years in higher education, during which I have consulted with hundreds of higher education institutions, I am both continuously optimistic and somewhat concerned for the academy.

Campus technology, including distance-learning tools, is still an area of some mystery and underutilization more often than it is not. Its organization is often more accidental and political than operational or sensible.

Writing this article was a challenge because there are no easy answers here. However, my thinking was greatly influenced by the clear and beautiful views of the bay off Union Hall, Ireland, and the many who contributed to the sense of perspective necessary to complete it while on holiday. Although our problems can seem quite daunting, they are usually manageable if we have the will to try.

Special thanks to Amy Clevenger for deciphering work via the fax machine!

Introduction

No matter whether one leads a business or a university campus, one cannot avoid two basic truths of our time:

First, the world of technology is a staple of the 21st century, and the digital tools that are at the heart of it will affect the success of organizations of all kinds. That is not our choice.

Second, how we organize the leadership of the technology area will greatly affect our ability to strategically leverage these digital tools to have a positive impact on the organization.

With the threat, or promise (depending on your last experience), of e-business, Web-based whatever, distance learning, and networked everything, it is not unusual for the central leadership of an organization, especially higher education campuses, to delegate

this worry quickly to any easy and available source—often the computing services area.

Since developing the first fiber-optic networked campus, “The Campus of the Future” project at the University of Pittsburgh in the early 1980s, I have consulted with states, campuses, K-12, and business organizations in the United States, as well as in Canada and Latin America. What I have learned from those interventions in the lives of leaders and organizations is the basis of what I will share here. I have received just enough recognition for my work and I have just enough experience to realize that I do not hold any ultimate answers, especially in a general article.

by

Ray L. Steele, PhD

Ball State University

Much as in politics, technology organization issues are always local, and solutions must be designed to fit the local context. However, there are some very common issues which appear over and over in my experiences with scores of clients. These have helped me to evolve some lessons that I will share here.

While these lessons come from my experiences, I would recommend two contemporary sources, *Net Ready*, by Hartman and Sifonis (McGraw Hill, 2000), and *Cyber Rules*, by Siebel and House (Currency/Doubleday, 1999), for a very recent confirmation of some of these lessons.

Lessons Learned via Experience

Lesson #1: The Change Issue

Most campuses, unlike businesses, do not represent a present problem, but a past problem moving into a fast present/future time. It is no wonder that the speed of change makes the inevitable threat of change ever more troubling.

It is also no wonder that solutions and leadership for them are sought in past- not future-based contexts. The point is old dogs can be taught new tricks, but they do not come to them without training.

Lesson #2: The Leadership Education Challenge

Many campus presidents, chief academic officers, and even VPs for business affairs have little to no background in technology issues beyond the use of a PC or other common end-user tools. This is simply one of many issues they must manage. Thus, it is easier to delegate the function to others with whom they are comfortable whether they are prepared for the task or not. It is also easy, after having delegated, to put the group

leadership head in the sand on this complicated area. It is hard to achieve, but essential for success, for leadership to gain a broad understanding of the benefits of the strategic application of technology.

Lesson #3: Users Are at the Heart of Success

Building user-based solutions, providing user-oriented tools and systems, and selecting and supporting user-oriented technology area leadership is uncommon. Asking faculty, who are the ultimate information workers, whether it is easy for them to get the information they need to do their job is seldom done.

This relates directly to the problem of all old businesses as well as campuses. The application of information technologies was originally sold on the argument of economies of scale; now we have moved to the potential for one-on-one services, and this change suggests a loss of central control to the individual. It is as common as the resistance of MIS groups when the shift from central computing to PC and desktop computing occurred. It is also for that reason that computing services organizations can rarely be the source of user-oriented tech leadership.

Lesson #4: Planning, Strategy, and Alignment with Mission

In an electronic era dominated by fast decisions, campuses are caught up in old planning models that are too formalized to accommodate a more peripatetic strategic thinking process driven by easy and continuous information access.

Thus, it is critical that campus leadership clearly articulate the overall campus mission and set technology leadership structures which are given the freedom to act as long as they stay aligned with the mission. This allows tech

leadership to seek out and respond to changing and even quirky user needs while ensuring the provision of an overall infrastructure and network access for all. Special and sometimes expensive application development projects can then be decided based upon their alignment with the mission and available resources, not based upon what would be "fun to do" by a group with limited perspective.

Lesson #5: The Nearly Certain Future

There are few certainties in this rapidly changing world, but just as I "safely" predicted a digital future in the midst of an analog time during development of the first Campus of the Future in 1982-1983, there are some safe future predictions for campuses and their technologies.

- They will face continuously growing expectations from students, faculty, and staff. Technology capabilities will continue to grow as an ultimate differentiator in competition for good students, good young faculty, and resource-driven opportunities, including giving. More and varied applications of technology for teaching and learning in the classroom will occur, while at the same time more pressure from Web-based and varied distance-learning technology-driven activities will buffet the campus.
- Marketing of the campus, its courses, and its faculty capabilities will become more at issue as the digital world provides less group and more individual, one-to-one contact potential with varied constituencies.
- Change, even on the most traditional of campuses, will occur more rapidly due to cost- and consumer-based demands. It will not be acceptable to offer minimal experiences with an expanded

consumer (student) knowledge base of competitive services available.

In short, the easy access to information for faculty and students will force institutional upgrading and change, or enough faculty and students will leave and that will cause even more disturbing change.

Organizing for the 21st Century

There are some simple, yet often troubling considerations which are critical when approaching the technology organization decision.

that if faculty use technology in class well, they can do more and better work in engaging, focusing, and motivating students to participate in the teaching-learning experience. That does improve education. It also demonstrates an institutional commitment to providing faculty and students with modern tools.

Curiously, this case would often not need to be made if we were talking about a new football stadium or a fieldhouse for a successful basketball team. However, we still often take for granted the tools needed by the users

whether an institution is information and communication capable in its operations. Used strategically, technology makes a big difference.

The Fundamentals of Organizing Technology Leadership

If this strategic tool can make such a difference, then some basic criteria should be considered in organizing if you are to succeed.

- Organizing and leadership efforts should lead to better focus on and clarity about what technology can do for various users.
- Leadership selected must understand and press for network thinking. No islands of ego, no unconnected solutions are needed.
- Leadership must have the courage to have no small dreams. Replacing a few high-end PCs for the politically "loud" and plugging holes in a high-tech dike is worse than not organizing at all for users.
- Organizing efforts must assume both academic and business area input that is direct, and technology leadership must be positioned as senior and as part of all institutional planning with a reporting line direct to campus leadership.
- Campus leadership must have the courage to select a somewhat different executive for the technology leadership role. This is not the typical director of computing role.
- Campus leadership must also realize that you get what you pay for in this case, especially. Done well, this role can be of incredible impact on the campus mission and the president's own ability to succeed with various constituencies. Making a bargain hire based on easy political choices will likely compromise the progress made in the newly organized function.
- Finally, organizing for guaranteed input via user constituencies is critical to success. This means that

[I]t is critical that campus leadership clearly articulate the overall campus mission and set technology leadership structures which are given the freedom to act as long as they stay aligned with the mission.

Technology as a Strategic Tool

To be competitive in a time when new (and not necessarily good) models of education are being offered as often as a new e-commerce idea strikes business, it is important to think of technology's role as a strategic tool used to help the campus meet its mission.

Having a technologically capable campus, including an infrastructure—wired or wireless—that supports analog and digital voice, data, and video sources via internal and Internet sources, affects the campus mission in numerous ways.

Although the evidence is not clear that technology in itself has a direct relation to improving learning—after all, it is just a tool of our times and not "the solution" oversold by computer marketers—it is eminently clear

(faculty, staff, and students) to do the daily business of higher education.

Consider that recruitment of both faculty and students is influenced by the presence of technology, especially by how that technology is used as students come into early contact with the institution.

Alumni expectations and, consequently, their giving are affected by ease of communication and by their pride in the quality of the institution's efforts, which are often affected by the use of technology.

Major giving campaigns, contact with state legislators, attraction of corporate partners, research projects, new academic programs relating to our times—success in all can be affected by both the perception of being a modern and technically capable place as well as

an apparent and direct means of faculty, student, staff, administrator, and institutional advancement (recruiting, alumni, development) functions must have easy and fast input regarding the impact of plans, systems, and applications on their work areas.

If This Is True, Then What to Do?

Having been bold enough to share all the above lessons from experience and the organizing considerations, let me offer one model for organizing which I believe can "deliver on the promise."

1. I recommend using what is commonly called the chief information officer (CIO) leadership structure. While the title must fit the organizational context, to be effective it must clearly designate a single executive in charge of integrating information and communication functions, no different from the academic affairs officer or the business or student affairs officer. The position must be included at the budget table and should report to the CEO. The practical implications of the CIO's presence in the leadership team ensures that senior executives are better educated on the potential for technology, that technology applications and plans better mesh with institutional strategies and mission, and that resource choices are informed before, not after, the fact.
2. Under the CIO create an office of Campus Information and Communication Support Services. This includes the authority, responsibility, and budgets for the campus infrastructure and networking, telephone, computing (business operations and academic), video, satellite, web, and distance learning services and technologies.

Each of these functional areas may retain its own unit head, but

integration of many functions across a broadband-capable network is the ultimate goal.

3. A Campus Information Users Planning and Advisory Council or Committee should be established and chaired by the CIO. A single representative each for faculty, administrative, and student users (the students could be represented by a staffer with a student joining each year) should be appointed. Each should be charged with establishing a regular and broad feedback process with his or her constituency to prepare for monthly review meetings with the CIO. This user-needs-driven approach should ensure that the users are considered first and regularly in the planning and decision processes. It should help to avoid dominance by any technology area staff and the desire to serve their interests first rather than users.

The nature of any technology-based environment today, especially in a campus situation, involves the search for focus (involving educated leadership), clarity and alignment of technology strategy with institutional mission and resource planning, and effective two-way communication with users. It costs too much to misuse or minimize technology, and most institutions will no longer do well without it in the 21st century.

The CIO-led office of Campus Information and Communication Support Services model (emphasis on service and support functions is essential) and a Users Advisory Committee represents a focused effort to bring overall user satisfaction together with strategic technology applications leading to real leverageable advantage for the overall campus.

Consider a reasonably simple example that involves lots of campus resources and contact with every student in a well-managed and technologically capable campus. Instead of myriad student adviser meetings involving a perfunctory course selection process, why not allow students, with appropriate application software and secured level access restrictions, to do course selection electronically on the network and visit with advisers live to consider their life and academic goals? It puts responsibility for their education appropriately in the hands of students (who can now go on the Web and get whatever they want individually anyhow).

It also allows professionals, the advisers or faculty, to do higher level work in helping students to focus on goals and to align choices with them. If we use technology well, this can lead to improving the educational experience for students and help to create more satisfaction for professionals on campus.

There are no simple, single, or easy answers here. But there are better ways to organize the technology leadership function. The above represents one way that can work. Ultimately the will of leadership and the trust of users will make the difference.

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Campus Reengineering at the University of Mississippi



by Buster Clark
University of Mississippi

new software package for the campus. In 1997, the University received a private donation that provided the funding.

Laying the Groundwork

The administration made the decision early in the process to get outside assistance with this project. The University developed an RFP to negotiate a contract with a consultant who would provide expertise and assistance in reengineering business processes. Two consultant firms responded to the request, and the firm offering the required services for the lower cost won the contract.

Staff from the selected firm came to campus and spent several days visiting departments and conducting interviews with various University staff members. From the visits and interviews, the consultant prepared and submitted a report to the administration identifying areas in need of being streamlined and made more efficient in providing services to the University commu-

Over the past four years, the Telecommunications Center at the University of Mississippi has made significant improvements to the campus network infrastructure, providing transport facilities to implement a campuswide business process reengineering and software replacement project. These improvements consisted of the following:

- Installing a comprehensive single-mode/multimode fiber-optic backbone connecting every building on campus
- Installing network connections in every classroom, lab, conference room, and office
- Installing network connections, two per room, in all residence hall rooms
- Replacing the ATM network architecture with gigabit Ethernet

With network connections in every room and a high-speed backbone, the infrastructure provided some of the tools necessary to consider reengineering business processes and installing a

nity as well as to contacts outside the University. The report also identified the need to replace the 25-year-old legacy software because of integration issues, maintenance headaches, inflexibility, training, and support.

The administration wanted the project carried further. The report indicated that problems existed but did not provide solutions. The University employed a second consultant firm to provide trained staff and assistance in examining the current business processes on campus in a more in-depth manner, provide a plan for reengineering the processes, and assist in the selection of a new software package. The University wanted more efficient and effective service to the users of all services on campus.

Nothing that pertained to academics would be part of the

project, but faculty—who use administrative processes and software—wanted and needed to provide input and were invited to participate. The administration selected a project director and identified workspace in the center of campus for the teams. Critical decisions were made early, such as:

- Teams were to be given ownership of the particular projects that would be assigned.
- “Thinking outside the box” would be stressed.
- Teams were to be presented the question “What would you do with your processes if you were starting a new university?”
- Teams had to meet as much as possible outside their office environment in the project space provided.

Preparation was now under way to begin the reengineering of the

business processes in the areas identified. Teams, including 46 staff members from various departments, assembled to examine current processes in the following areas:

- Athletics
- Auxiliaries (telecom, student union, printing services, etc.)
- Facilities
- Financials
- Human resources
- Information technology
- Research and communications
- Student life

The project director and the associate vice chancellor of information technology decided not to assign a team to reengineer the processes in information technology, preferring to put IT reengineering on hold until a later date. Many of the IT staff would be involved in evaluating, selecting,

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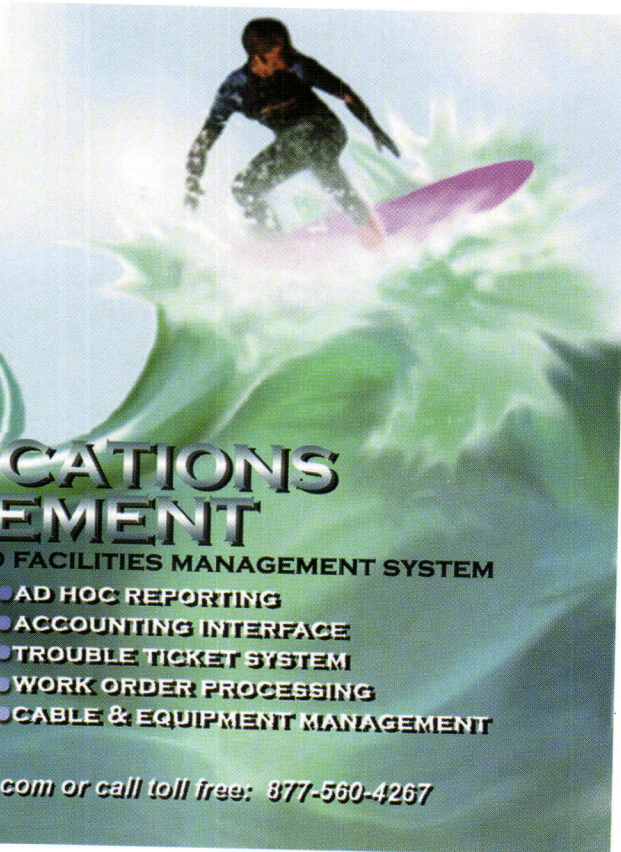
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and implementing software to replace the legacy system.

The consulting firm provided a week of training on how to reengineer business processes. Two definitions to keep in mind during a project like this are:

Reengineering: A fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance such as cost, quality, service, and speed; and

Process: A collection of activities and tasks that accepts input from one or more sources and creates an output that is valuable to the customer.

The team held a contest, and Project DISCOVER (Deliver Improved Services to Our Customers and Organization Via Effective Reengineering) was selected as the name for the project.

Getting Down to Business

Teams were tasked with producing documents identifying each process and containing the following information:

- "As is" description of current processes
- Flowcharts of each process
- Business process profiles for each process
- New processes

The teams identified 600+ processes in the selected areas that needed further study. The consultants and selected University personnel condensed these 600+ processes into 69 specific projects.

The project director and selected administrators and staff assembled a second group of University staff into 69 teams, one for each specific project. Those

teams included 165 staff members. Each team had one member from the previous teams. If questions surfaced about what had transpired in previous meetings, this person could explain what the previous team had done. Several staff members served on more than one team. The teams had to discuss the projects and make recommendations for implementation. The project director and selected administrator appointed a steering committee from staff, administrators, and faculty to serve as an oversight committee to approve, delay, or reject recommendations developed by the teams. If the steering committee accepted the recommendation, the team would develop a "detail design" for implementation and proceed.

At the same time, staff from IT, as well as other selected staff and faculty, started the process of deciding on the software package that would best suit the needs of the University. Vendors made presentations addressing certain scenarios developed by IT and other key department personnel. Anyone on campus interested in the presentations could attend. A software selection team evaluated responses to the RFP, vendor presentations, and input from potential users of the software and made a recommendation to the chancellor.

After the chancellor approved the recommendation, the University accepted an aggressive timetable to implement the software selected. Financials, human resources/payroll, materials management, and plant maintenance modules took less than a year to implement. The Funds/Position Management module is scheduled for completion by the end of this year.

Lessons Learned

We learned several valuable lessons from the campus reengineering project. Listed here are five of the most important:

1. Do not call a project like this "process reengineering." The chancellor said from the beginning that nobody would lose his or her job because of this effort, but the fear of termination remains with the staff. "Process redesign" is a better description.
2. Communicate everything in every way possible about the status of the project. A major fear among staff is that things are being "done behind my back."
3. The grapevine is very active, spreading inaccurate information as well as accurate. Address rumors immediately and accurately.
4. Training, training, and more training must be provided, and it needs to be handled by a professional trainer, not someone who is on your department's staff.
5. Widespread resistance to change happens at all levels, from new employees to veterans. Certain types of individuals will refuse to change and will leave.

Major Changes

While the overall reengineering project is not over, the University has implemented several process changes. Some major changes are:

1. Elimination of the car pool used by faculty and staff. The team found that based on the trips made, renting cars from an agency when it was necessary to provide transportation was more economical than maintaining the car pool.
2. Establishment of a Procurement Office that combines purchasing, accounts payable, receiving, and travel into one central location.

3. Implementation of a semi-monthly payroll schedule instead of the combination of monthly, every two weeks, and special payrolls. This eliminated some twenty payrolls and streamlined the process.

4. Transfer of pager service to telecom from physical plant.

5. Issuing of work orders for telecom and physical plant services electronically instead of on paper.

6. Merger of human resources and payroll in order to provide employees one place to address items related to their employment.

During the implementation of the software, the campus reengineering project was scaled back, primarily because the software would force some necessary changes in the processes. The University made the decision to wait on resuming reengineering until installation of a major part of the software was complete.

Reengineering IT

With several modules of the new software as well as some reengineering processes in place, the associate vice chancellor of IT decided to reengineer business processes in information technology. He appointed a team lead from IT and instructed him to form a panel of faculty and staff and to produce a report by August 2000 with details and recommendations to provide more efficient and effective service to the University and "outside" users of information technology. Five senior staff members from IT, two faculty members, and four members from the administrative community served on the team.

The final report consisted of a brief description of business processes, an organizational chart,

implementation time lines, skill set recommendations, and a description of computer science/management information sciences' connection to information technology.

The team met on a weekly basis to gather information and develop a strategy that would result in a more effective and efficient IT office. Information collected from and by IT staff took a variety of forms:

- Senior staff members produced a current organization chart and short paragraph defining their roles and duties.
- Staff members submitted a current list of duties performed and the percentage of time spent on each.
- Staff members submitted a position profile of their individual jobs including duties and skills required for that position.
- Senior staff members invited all IT staff members to attend a PowerPoint presentation describing what each unit did in relation to the mission of IT.
- The team developed a list of constituents, and each senior staff member provided information as to the constituents served by his or her particular area and the service provided. Team members other than IT provided input into this process.
- IT staff had the opportunity to complete (anonymously, if they desired) a survey related to how they felt about IT.
- The business school developed an electronic survey that selected faculty and staff could answer anonymously.
- Team members searched for other institutions providing services similar to the University.

- Academic computing developed a password-protected Web page to which team members could post information as well as minutes of all meetings.

All information collected provided a foundation from which to develop the report. The team leader suggested members "think outside the box" in making suggestions and put everything on the table for consideration. All agreed to keep confidential and leave in the room anything discussed in the team meetings.

During meetings, the team discussed every item at length, depending on its complexity. Nothing brought up in the meetings escaped discussion or faced elimination without due consideration. Controversial items surfaced and were discussed with the understanding that we wanted to make sure the associate vice chancellor of information technology and the University administration knew the team had the commitment to search for answers in providing a better IT organization.

The team leader requested members submit recommendations, issues, or comments for each team member to vote on via the Web page. The vote could be one of three choices: agree, disagree, or unsure. The Web page contained an area for comments concerning the item considered.

The Final Report

On August 15, 2000, the team lead presented the Information Technology Reengineering Report to the associate vice chancellor of information technology. It contained detailed information or referenced the Web page for information requested in the initial charge to the team.



The report contained two exceptions from the original charge. First, it did not address the skill set recommendations for positions. After several discussions, the team decided that developing skill set recommendations should be delayed in order to involve human resources. Human resources would be asked to help with two things: (1) Identify skill sets for positions—not titles, and (2) reduce the number of job titles in IT.

Second, the team did not recommend any changes in the current organizational chart. A majority of the team voted to have it remain as is for the present but revisit the issue after the last module (campus management) is installed.

The report contained 122 separate recommendations, issues, or comments voted on by team members. Each document provided a description, how each team member voted, and what comments were made.

The associate vice chancellor of information technology accepted the report but asked the team leader to condense the projects into "super projects." He and the administration would make decisions regarding the implementation of approved projects.

Some of the recommendations that were approved are:

1. Realign personnel based on area of expertise. This would provide a smoother process in addressing needs of the user.
2. Move processes to a different area to provide continuity. Some processes were fragmented and needed combining.
3. Schedule regular meetings of directors to provide more improved communications and cooperation between divisions.
4. Realign duties of selected personnel. For example, remove office administration duties from the training coordinator so she could devote full time to training users on the new software.
5. Appoint an external review board to establish priorities of requests from constituents.

Conclusion

Reengineering will not be a onetime occurrence in information technology. The team decided that several of the recommendations would be ongoing and would need attention as more University-wide reengineering is undertaken and replacement of the legacy system is completed.

A major part of the new software is installed and working. Reengineering of campus processes will continue indefinitely. Replacement of the software continues to progress with the University being selected as the pilot for a campus management software solution, which will replace our current student information system.

The reengineering of business processes and software implementation on our campus has not been easy. Because it forced change, some faculty and staff continue to resist making the adjustments. It is impossible to know ahead of time how people will react to a project of this magnitude, but we quickly found that when changes happen, people become nervous and uneasy.

Please visit our Web site at www.olemiss.edu/projects/discover/ for additional information on our campus reengineering project.

Buster Clark is the director of telecommunications at the University of Mississippi. He has been at Ole Miss for 35 years and has been in telecom for the past 16. Reach Buster at tebuster@olemiss.edu.

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Supporting Academic Services One-to-One

by Mick McKellar

Michigan Technological University

Faculty members both want and need to make course materials available over the Internet and the campus intranet. To accommodate this need, a little over a year ago, we implemented WebCT at Michigan Technological University. Today, about 50 faculty members are regular users.

Change does not come easy to most of us, and accepting new technologies, even when they may make certain tasks less burdensome, requires that we change. The implementation of WebCT at MTU illustrates the methods we used to put a human face on the system and support these technologies effectively for faculty, who were both excited and confused by the possibilities.

A faculty member once told me that he wanted to be "a pioneer on the trailing edge of technology." This sums up both the urge to lead into new territory and the fear of venturing past the technical leading edge.

These conflicting emotions are at the heart of most of the reluctance to try the newfangled tools we search out in support of our teaching and research faculty at Michigan Tech. The key to successful implementation of these new courseware technologies appears to involve encouraging the urge and relieving the fears. At least, this is the approach we have taken.

Encouraging the Urge

WebCT is course management software that offers an infrastructure and interface for creating online courses, from simple to complex, enabling the delivery of course materials and more to students both on and off campus. It also offers tools for presentation, communication, and collaboration as well as a comprehensive set of course management tools for evaluation, assessment, and improvement. It runs on a central server and is totally accessible by administrators, instructors, and students through Web browsers. (http://about.webct.com/prod/index_frameset.html)

Our efforts to encourage faculty members to use new technologies such as WebCT involve these steps:

1. *Find faculty already doing what you want to help them do.* If you can locate a faculty member who has

been struggling with putting course materials on the Internet, and you can show him or her a new and easier way to accomplish this task, you have a pilot for your pilot.

For example, several interested faculty members wanted to deliver material on the Internet and were frustrated with the limitations and problems of an earlier system. We introduced WebCT, and now a professor in electrical engineering scans her handwritten course notes and examples to Adobe Acrobat PDF format and places them in her WebCT course, making them available immediately after class.

A professor in mechanical engineering has several animations of metals-forming processes and some relevant video clips. He is able to deliver the animations and the streamed video as part of his WebCT course.

2. *Demonstrate a new and more efficient way to do it.* Learn what they are trying to do and show them how to do it with the new tool. Make it work for them, right before their eyes. Work with these early adopters to make their efforts successful.

I invite faculty members who have determined that WebCT will be useful to them into my office for a one-hour, one-on-one session. Together, we set up their course and put it on the Web immediately. When they leave, they can log in, make changes, move things, put a syllabus out, and accomplish a number of other tasks right away. Of course, as they use the software their proficiency improves. But they leave my office with a sense of accomplishment and confidence that they can succeed.

3. *Publicize the successes and how easily they were accomplished.* Find a forum to share the success with other faculty at your institution, and if at all possible, ask your

successful faculty members to present the result to their colleagues. It means so much more coming from a colleague than from a technical support person. At MTU, we hold "discussion luncheons" at least once per semester. These luncheons bring together WebCT users and potential users to discuss what they are doing. (Free food makes the invitation even more appealing!)

4. *Document carefully and clearly how it was done.* Faculty members are extremely busy, discipline-centric individuals. They seldom have time to learn a new technology from stem to stern and want to know how to implement what they need without a lot of time investment and problem solving. Therefore, it behooves you to supply (or create if necessary) lots of simple and easy-to-use documentation detailing how to accomplish the tasks, step by step. We use a WebCT course called WebCT@MTU as a central clearinghouse and discussion center for support of the program. All WebCT users are automatically subscribed. (WebCT@MTU Welcome Page, <http://courses.mtu.edu/public/dcs005/index.html>)

5. *Focus on course delivery.* It's really nice that the technology is fast and integrates with the Apache Web server and runs on a central server, and so on. However, faculty members really want to know how the technology will help them deliver their course materials and how much additional work will be involved. Test adequately before introducing the technology so that you can focus specifically on course delivery issues. Working with your faculty early adopters can really help on this issue.

Relieving the Fear

The fear of rushing into a new technology and stumbling is a very

real fear and must be dealt with at the outset, or you will have many excited teachers and researchers who simply won't use the tools. An online course is a very public forum (at least for the students and colleagues that have access to the course). No one wants to rush into using a technology that fails to deliver; the results are embarrassing and can be damaging to one's career. So this is serious stuff. What can we (as technical and application support personnel) do to help guarantee success?

- *Skip the manual.* If at all possible, have the application support staff use the technology without referring to the user's guide and manual. Chances are, this is what your users (faculty, staff, and students) will do. You need to know what kinds of trouble they can get into exploring the technology without a guide. This will better prepare you to lead them back from their adventures.

- *Learn the technology.* Take the time (and it takes lots of it) to learn to use the technology as a faculty member must use it. Test and retest the technology, pushing the limits until you can find where and how it will break. Know where the bugs are and how to work around them. Make certain your technical support is rock solid; a network problem is still just a problem to the user, who doesn't likely know what happened. Allow application support staff to tap additional staff "guinea pigs" to try out communication, assessment, and administrative functions in the software. Don't wait for faculty members to test it on unsuspecting students.

- *Talk about it—all the time!* Make presentations, and ask your faculty early adopters to aid in these presentations (or give them). Prospective faculty users want to know that colleagues have used the

technology and found it both useful and easy to use.

- *Open communications.* Arrange simple and easy lines of communication for users to reach your support personnel. Use the course software to create a support site that allows faculty to use the software as a student and get a real taste of the benefits and limitations of the technology. We created "mailto:WebCT@MTU."

- *Become a professional service firm.* Adopt the attitude of a professional service firm, as author Tom Peters suggests (*The Professional Service Firm 50 Or: Fifty Ways to Transform Your Department into a Professional Service Firm, Whose Trademarks are Passion and Innovation*), making faculty members your clients. Respond immediately to all requests for aid, even those that seem more along the lines of course development than technical support. Make faculty

members feel like valued and well-cared-for customers.

- *Work weekends.* If at all possible, make certain someone checks on potential problems over the weekends and in the evenings. Faculty class development time is seldom a 9-to-5 proposition. We check on e-mail reports of problems and try to fix them immediately. Even if we cannot fix them until Monday morning, responding with assurance that we will address the problem as soon as possible is reassuring and supportive.

- *Listen carefully.* It may be the 15th time the problem has been reported to you, but it's probably the first time for this user.

Final Thoughts

It is easy to be so focused on the technology that the users get lost in all the glitz and hyperbole. Keeping a customer-first, people-centered focus on the ultimate goal

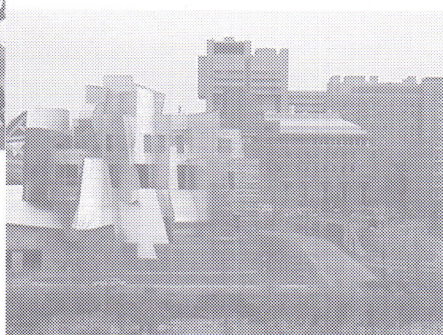
(from the faculty perspective) helps to channel effort to the place it is most needed and to avoid confusing your clients with technical jargon and "geekspeak" that will only make them feel isolated and lost.

Making new technologies more palatable to reluctant users requires a lot of one-to-one (that's person-to-person) communication and homework. It requires putting on the shoes of the professor and walking a mile or two down the road of course development, even if that is not the focus of your support staff. After all, it really is all about delivering the goods to the students and giving both faculty and students new and useful tools to accomplish more in less time with better results.

Mick McKellar is editor/analyst for Distributed Computing Services, a division of Information Technology at Michigan Technological University. Reach Mick at mckellar@mtu.edu.



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*Consulting In Telecommunications
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Deny Internet Access?

When?

Why?

How?

by Chris Harrison

Is it fair, legal, or even proper for an institution to deny access to Internet sites? A whole range of establishments are struggling with that question. Universities worry about becoming accessories to copyright violations. Private enterprises see their computing power slashed as individuals download huge files of music. Libraries are concerned about individuals—especially minors—viewing pornography on their computers. There are solutions, ranging from the heavy-handed to the technical to the legislative.

Probably the most high-profile case today involves Napster. The music industry feels its right to copyright is violated by people downloading protected music over the Internet. Rock groups such as Metallica have come out against sharing music over Napster, citing lost record sales, while other singers say they feel it is a good idea, getting their tunes more exposure.

While the rock groups get the headlines, in almost every case it is the record company, not the singer, who stands to lose the most money. The companies also have the consolidated resources to fight sites such as Napster and have entered the fray, no holds barred.

IS and IT people are taking notice. In mid-September, Penn State University, University Park, Pennsylvania, warned students and staff members that it would suspend the computer access account of anyone who used programs such as Napster on its network to circumvent copyright.



Penn State is not opposed to downloading noncopyrighted material. The question for a student user is how to determine which is which. Penn State made it clear to users that any computer tied to its network would be subject to monitoring for violations. It also threatened to suspend access to any user upon receiving a complaint from any copyright holder who accuses the user of violating its copyright.

Some would say the Penn State move is more to protect itself than it is to honor copyright. However, the school did e-mail notes to about 80 students, identified as heavy users of copyrighted files, warning them that they could lose their on-campus network computing privileges if they did not change their ways. Will those students mount a legal challenge to the school's decision? That was unclear at press time. However, there are so many legal storms raging around the Napster case that it is difficult to predict just how final any one court decision would be.

Technical Solution

With the legal battles still up in the air, the technologists are weighing in with their own answers to the question. At least two firms offer a technological solution to the problem, and it is likely that products from other companies could be used in a similar manner to make using such sites unpalatable to users. Neither of the technological fixes actually blocks traffic.

"You cannot block network traffic," states Thomas O'Neill, director of product marketing for Allot Communications, Burlingame, California (<http://www.allot.com>). He says the courts frown on such action—although some universities

are blocking Napster traffic. However, he says, a network administrator can set priorities and can slow down undesirable kinds of traffic.

Mike Long of RadWare, Costa Mesa, California (<http://www.radware.com>), agrees that institutions are on shaky legal ground if they turn off services. "Libraries, for instance, cannot turn off porn," he says. "But they can make it as slow as molasses in January."

Basically, the strategy is to prioritize various kinds of traffic. The normal, everyday traffic gets a normal amount of bandwidth. Gold users get their unlimited bandwidth when required. But those using systems like Napster or downloading material from XXX-rated sites get such a low priority and so little bandwidth and throughput that it could take hours to download a file. They still can download the material—it's just that the song will be out of date before all the bits and bytes get into the computer.

Allot's NetEnforcer tool sits between the router and the network, massaging traffic. It is a policy-based system, which allows maximum or minimum bandwidth to be assigned depending on rules set by the network manager.

"You can minimize bandwidth to Napster, but you must be sure business-related stuff gets through," O'Neill says. "What this bandwidth management does is make undesirable sites too painful to use."

RadWare's solution functions in a manner similar to Allot's. The company makes a bandwidth management tool that allows session-by-session analysis of traffic, as opposed to the typical packet-by-packet management system. "It is much more efficient," Long says. Both differ from products like

LittleBrother. The package from LittleBrother Software, Milpitas, California (www.littlebrother.com), is an Internet monitoring system that allows dividing Web sites into 40 categories and allows creation of policies for limiting or blocking access to individual sites or to site categories. Features such as its InstaBlock allow restricting access to instant messaging, games sites, and similar bandwidth wasters.

Make a Law

Those on Napster's side are fighting back and are taking a legislative track to add muscle to their fight. H.R. 5275, dubbed the "Music Owners' Listening Rights Act of 2000" is sponsored by a bipartisan group including Rick Boucher (D-Va.), Richard Burr (R-N.C.), Fred Upton (R-Mi.), and Ray LaHood (R-Ill.). Its purpose is to amend title 17 of the *United States Code*, with respect to personal interactive performances of recorded nondramatic musical works.

The bill adds a new piece under chapter 1 of title 17 of the *United States Code* called "Personal Interactive Performances." The change adds after section 122 a new section called section 123 that deals with limitations on exclusive rights: personal interactive performances. The section reads, "Notwithstanding the provisions of section 106, the transmission of a personal interactive performance of a sound recording, and of any non-dramatic musical works embodied therein, is not an infringement of copyright, and it is not an infringement of copyright for a transmitting organization that transmits a personal interactive performance to make or cause to be made phonorecords or copies of a sound recording and any non-dramatic musical works

embodied therein if such phonorecords and copies are used by the transmitting organization solely in connection with the transmission of personal interactive performances."

The measure defines the term "personal interactive performance" as the "performance of a sound recording and the non-dramatic musical works embodied therein by means of a digital transmission and includes any digital phonorecord deliveries associated with such transmission, provided that the transmission is received only by a recipient who has provided to the transmitting organization proof that the recipient lawfully possesses a phonorecord of such sound recording and who has conveyed to the transmitting organization a

specific request to receive the transmission of the performance."

H.R. 5275 also includes several technical and conforming amendments. However, it is clear that the big music companies will see this as an assault on their rights to control their product. Many observers doubt that H.R. 5275 will get beyond preliminary hearings, if that far. However, that the measure ever saw the light of day shows the amount of interest and the widespread feelings on the topic of freedom of the Internet.

Where Will It End?

Where and when will all of the controversy be ironed out? As this article was about to go to press, Napster announced it was forming an alliance with Bertelsmann AG, a

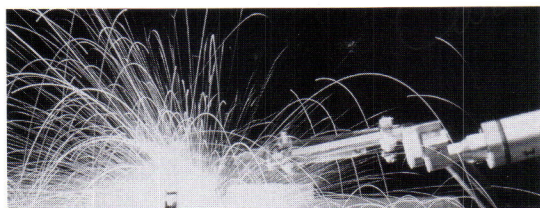
German media company. They plan to develop a dues-paying membership program, and those dues will be used in part to pay royalty to artists. So at least part of the Napster issue is resolved.

Likely the U.S. Supreme Court will have the final word on the topic. In the meantime, however, look for much continued litigation over copyright, freedom of expression, Internet access, users' rights, and financial injury in both local and district courts. If not to rock-and-roll fans, it should be music to the ears of the many lawyers who will become involved.

Chris Harrison is a freelance writer and frequent contributor to the ACUTA Journal.



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Institutional Excellence in Telecommunications Indiana University

As a winner of the prestigious Institutional Excellence in Telecommunications Award, Indiana University was honored at ACUTA's 29th Annual Conference for its Knowledge Base. This article was adapted from material submitted for the award.

As technology continually changes and advances, support options must evolve as well. Any institution concerned with such an evolution is challenged to address the need for extra support without increasing investment in that support. Indiana University seems to have met this challenge with its creation of the Knowledge Base (KB).

Created in 1988 primarily as a support tool for e-mail, telephone, and walk-in consultants, the KB originally served as a repository for general computing knowledge used by consultants at IU to answer user questions. Since no one person could be expected to retain all of this information, the KB served as an



Mike Lucas, surrounded by friends and co-workers, accepted the Institutional Excellence Award for Indiana University at the Annual Conference.

invaluable resource in helping consultants solve problems satisfactorily.

The Knowledge Base began as an internal "warehouse" of support information, then evolved into the end-user support tool it is today. The KB is, essentially, an expert system. The interface is via the most accessible application available, the World Wide Web. The user enters a question through the use of keywords or in "plain English," and the KB searches an information database and then offers a



list of possible answers from which the user can select.

Because it was developed in-house, the KB allows the University Information Technology Services (UITS) staff to maintain complete control of its content and presentation. In addition, all of its changes and procedures have been documented in the *KB Handbook*, which is used as a ready reference by the staff.

One unexpected challenge during development was the realization that some information is applicable to different users under different circumstances. To address this, "domains" were developed to separate sets of information pertinent to IU users, users at specific campuses, support staff, or the general public. When a user submits a question, the search mechanism uses the IP address of the user's computer to determine which information to provide.

Any time technology such as the KB is used, risks such as technical problems, security, lack of resources, and accuracy are involved. But the information contained in the KB undergoes an almost constant review, thus ensuring its integrity. Several processes are in place to ensure that each document is reviewed regularly for accuracy of content.

As technology has evolved, so has the KB. Programmers are

working on the third version of the base, making it more robust, more powerful, and easier to maintain. Also under way is the development of a cataloging index that will provide users with another method for locating information in the KB.

Over time, the KB has become a "collective memory" of all parties involved in support, even those no longer with UITS. It has an expert system quality to it, with a system of checks and balances in place to keep the information accurate. In



addition, all support staff can submit questions to the KB via the "ask a consultant" link at the bottom of each search return. In this manner, the KB receives input from all over the world, consequently extending the usefulness of the knowledge it holds and keeping it responsive to the needs of its user.

The Knowledge Base is deployed for use on all eight campuses of IU, making it a truly systemwide service. The student, faculty, and staff populations on the eight campuses are very diverse, but the

KB has proven to be effective in meeting support needs for all types of users, on all campuses of the university. It is an especially valuable tool for the remote user. This aspect of the base will be of particular value as the institution becomes more involved in the delivery of distance education.

The KB is an integral part of IU's information technology environment. It is a ubiquitous part of the campus: It is introduced to new students at orientation, is promoted

by professors, and has even been featured in *IU Update*, a short news report televised during halftime in basketball or football games. Its URL is printed in nearly every document published by UITS, no matter how wide the distribution.

IU has long recognized the importance of information technology to its overall teaching and

learning, research, and service missions. The university has commenced a major initiative to overhaul its enterprise-wide information systems, the largest software engineering project in its history, including plans for a customizable Web-based environment.

IU is also the home of a sophisticated and powerful environment for research, academic, and administrative computing. The university manages the network operations center for Abilene, the backbone network of Internet2; TransPAC, a network connection between the

United States and the Asia-Pacific region; the Science, Technology, and Research Transit Access Point (STAR TAP) in Chicago; and EuroLink.

IU is also home to one of the world's most advanced projection-based, virtual reality programs, providing new opportunities for achieving excellence in research instruction. IU firmly believes that information technology has the potential to transform higher education and takes steps to ensure that its students, faculty, and staff have the best resources possible.

The KB is a source of pride and a focus of commitment for UITS and for the university itself, and its scope continues to expand to different aspects of training and learning.

Although it predates IU's Information Technology Strategic Plan by nearly 10 years, the KB naturally became a component when the document was written in mid-1998.

The Knowledge Base has proven to be an efficient and effective way to meet the almost insatiable demand for the support of information technology. The KB receives nearly 90,000 hits each week,

supported by 460 staff hours, whereas traditional support services (telephone, e-mail, and walk-in) receive approximately 2,600 hits each week at IU Bloomington alone, supported by 800 staff hours.

In comparing the two systems, the KB is much more efficient in delivering frontline support. In addition, the KB is available 24 hours a day, seven days a week, with this high level of performance guaranteed with a backup server. In contrast, telephone, e-mail, and walk-in consulting are often available during normal business hours, though some IU campuses do offer evening and weekend hours.

The KB has grown to contain more than 6,500 answers to computing questions covering hundreds of topics. It receives an average of 12,857 hits per day from users all over the world. The KB provides answers to questions that users might ask more than once, allowing UITS to use its limited human resources for specialized support of the more challenging, unique problems that cannot be handled in a knowledge base format. Users can help themselves

and avoid standing in line or waiting on hold.

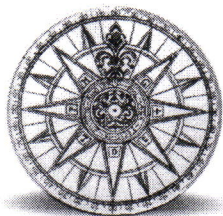
User satisfaction is measured by an optional survey located at the bottom of each search return and each document, as well as by comments and questions received at the KB e-mail accounts. Overall, comments have been favorable: Users have been involved in the KB from its conception, and, therefore, it is geared toward their needs and tends to meet their expectations.

Information technology is now an integral part of any modern research university, and IU continually takes steps to see that its students, faculty, and staff have the best IT resources available. As the KB grows and matures, it provides support in the ever-changing information technology environment. Without this, support staff would be overwhelmed and user questions would, most likely, go unanswered. The KB plays a key role in making sure that support for information technology matches the pace of its evolution.

For more information, contact Mike Lucas at mlucas@iupui.edu.



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Bill D. Morris Award 2000



Ruth Michalecki

University of Nebraska, Lincoln

Some people stand tall in the eyes of their colleagues in spite of their short stature. Ruth Michalecki is one of those people.

"Selecting the winner of the Bill D. Morris Award is a tremendous privilege as well as a serious responsibility," says immediate past president Tony Mordosky. "But I had no difficulty making my selection. Ruth Michalecki represents both the spirit of ACUTA and the best of the telecom profession to me.

"For myself and a lot of other individuals in the early 1990s, Ruth was our mentor. For years she taught the Introduction to Telecommunications course at ACUTA events, and so many of us who had telecom thrust upon us without any preparation owe her so much. Many times I called her with a problem that had me clueless," Mordosky continues, "and she always took the time to explain the technology or the reasoning behind it. She knew the implications and the impacts of every issue. Her experience is an invaluable resource, and her contribution to ACUTA is absolutely immeasurable."

In addition to serving as ACUTA's president in 1984-1985, she has served on the editorial review board since the *ACUTA Journal* began publishing four years ago and voluntarily wrote and edited the ACUTA newsletter for 15 years before professional staff was hired. She also serves on the ACUTA Legislative and Regulatory Affairs Committee.

Many other organizations owe a debt of gratitude to Ruth Michalecki. She is immediate past president/chair of ICA and presently serves as vice president on ICA's executive council. She is the chair of the ICA public policy committee and has chaired the ICA student paper competition for more than 15 years. She received the Stewart Dewar Award for her contribution to ICA and the industry, and not long ago she was honored by a group of universities at a reception at Ball State University.

Michalecki also currently serves on the FCC's Network Reliability and Interoperability Council (NRIC), which is charged with developing a set of standards for the public network to be used when voice, video, and data all travel on the same network. She also served on the FCC's Y2K council.

"Last fall," Ruth shares, "I was invited to Washington, D.C., to testify before a Senate committee on a hearing covering the digital divide between rural and urban America. I did this, and



For years Ruth Michalecki taught the Introduction to Telecommunications seminar at ACUTA events such as this one in Greensboro, N.C. in 1990.

about a month later, FCC Chairman Kennard and a few senators came to Lincoln, where I met them and took them to a typical rural town and school. I have been asked to testify again this year, probably in December."

Ruth has served on countless committees for the state of Nebraska as well as several Nebraska cities, and she has worked extensively with the state's public schools, community colleges, and two-year colleges. She maintains professional affiliations with ACUTA, ICA, MVCA (Missouri Valley Communications Association), NCUG (National Centrex Users Group), and EDUCAUSE.

She is a frequent speaker at USTA (United States Telephone Association), Supercom Expo, and of course, ACUTA, as well as others. In addition, she serves on the advisory board for the telecommunications degree program for several universities and has written scores of articles and papers for prominent periodicals.

For all her volunteer work, though, it is obvious that Ruth's commitment to the University of Nebraska at Lincoln has been top priority. She has been at the University for 41 years and was recently honored at a reception on campus after officially retiring October 1.

"It really seems strange not to get up and out of here by 7:00 every day," Ruth says. "However, I will get used to it, and I have no intention of not being active and staying involved in this great business of telecommunications. As an emeritus member I will still represent the University at ACUTA."

Ruth received a standing ovation at the presentation of the Bill D. Morris Award last July. As former ACUTA President Paula Loendorf says, "Ruth has been an inspiration to me since the first time I heard one of her presentations on student services at an ACUTA seminar back in the mid-'80s. Her entrepreneurial spirit, enthusiasm, knowledge of the industry, and drive to develop the best services for her institution have always been evident. Her willingness to share her experience and knowledge with fellow ACUTA members has helped to make ACUTA the organization it is today. I know dozens of members who, like me, became 'hooked' on ACUTA and its programs because of Ruth's presentations and presence at our events."

In Memory of Bill D. Morris

The Bill D. Morris Award was established in 1990 in memory of ACUTA's 17th president.

In 1988-1989, Morris led the association through the establishment of a permanent headquarters and the hiring of a full-time staff. His ACUTA career included service as president, executive vice president, and treasurer.

To many ACUTA members, Morris was more than just an efficient leader; he was a warm and caring friend. He passed away unexpectedly in 1989, shortly after completing his term as president.

ACUTA appreciates the spirit, vigor, and guidance Bill Morris brought to the association and welcomes the opportunity to recognize these qualities in another member each year in his memory.

Previous Award Winners

1990
Del Combs, ACUTA Admin. Director
1991
Mike Grunder, Yale University
1992
Sydney Paredes, US West
1993
James S. Cross, Longwood College
1994
Mal Reader, University of Calgary
1995
Valerie Turner, Northern Michigan Univ.
1996
Luther Robb, Penn. State Univ.
1997
Patricia Searles, Cornell University
1998
Whitney Johnson, Northern Mich. Univ.
1999
Anthony Tanzi, RCDD, Brown University

"Ruth's leadership in the 1970s and '80s helped mold ACUTA into an organization that would become an essential information and networking resource for telecommunications professionals in higher education," says former ACUTA President Steve Harward. "She worked tirelessly to produce a newsletter, plan and host an annual conference, serve as an officer of the association, and initiate the Introduction to Telecommunications seminar. As evidenced by her tenure at the University of Nebraska, Ruth has also been devoted to her institution and has been instrumental in efforts to find innovative ways utilizing telecommunications technology to achieve the goals of the University. Through her work in ACUTA, at UNL, and in other professional organizations, Ruth has provided a model for other telecommunications professionals to follow."

ACUTA is proud to honor Ruth Michalecki and expresses the collective appreciation and admiration of the association for one of the profession's finest.



From the Executive Director
Continued from page 48

ACUTA News

The *ACUTA News* is also read by a clear majority of survey respondents. Eighty-eight percent always read the lead story, 72 percent regularly read the "DC Update," and 67 percent read secondary stories on the inside pages.

Although we have been considering transitioning the newsletter from print to an electronic format for the past several years, a substantial number of members still prefer the printed version. Eighteen percent read the electronic version on the Web, and 42 percent read the print version. (Some indicated both, which explains why the responses to this question add up to more than 100 percent.) Another 42 percent say they skim the electronic version first but then read the print version.

Only 2 percent of respondents said they don't read either version.

Based on the responses to this survey, the publications committee has decided to continue offering the *ACUTA News* in both print and electronic versions for the time being, but we will continue to monitor member preferences in this area. We will also regularly update the graphic appearance and content of the *ACUTA News* in order to keep it relevant and enjoyable for members to read.

Legislative/Regulatory Update

The *Legislative/Regulatory Update* is distributed electronically each month to all institutional and corporate affiliate members. This publication is one year old, having begun in November 1999.

Forty percent of the respondents read 90–100 percent of the *Update*, and 74 percent read half or more of the publication. Only 11 percent of

respondents read 25 percent or less. It appears that a significant majority of readers read most of this publication.

An overwhelming majority like the electronic format—165 readers (95 percent) like the electronic format, and only 9 readers (5 percent) do not. This is ACUTA's first and only strictly Web-based publication, and it appears that members are reacting very positively to the format.

A majority of readers (52 percent) would like to pass the publication to others in their organizations electronically, but this is currently prohibited by copyright. In response to these survey results and a recommendation by the legislative/regulatory affairs committee, the ACUTA board has made a decision to permit ACUTA members to forward the *Legislative/Regulatory Update* to others in their institution or company via e-mail or other electronic means.

Ninety-two percent of readers felt the length of this publication was "Okay as is," while 5 percent found it too long and 2 percent too short. Based on this clear majority, we believe the length of the publication is on target with member preferences.

Finally, an impressive 98 percent of readers find the content "extremely useful" or "somewhat useful," while only 2 percent find it "not very useful." Based on this response, we are planning to continue the *Update* in its present format. However, beginning with the October issue, we have begun to include more direct hyperlinks to relevant background documents for readers who would like more in-depth information.

If you would like a more detailed copy of survey results, feel free to contact Pat Scott, ACUTA communications manager, at 859/278-3338, ext. 21, or pscott@acuta.org.

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Jeri A. Semer, CAE

From the Executive Director

The Survey Results Are In

Every two years, ACUTA conducts an in-depth review of the major programs and services that we offer to our members. The goal of this review is to ensure that programs remain relevant to the membership (based on quantifiable data and evaluation criteria). Through this review process, programs may be improved, streamlined, enhanced by electronic delivery, or even eliminated.

As part of the evaluation process for three ACUTA publications—the *Journal*, the *ACUTA News*, and the *Legislative/Regulatory Update*—we conducted a survey to assess member satisfaction. I thought I would take this opportunity to share the results of the survey with you, and some changes that we will be making as a result of the survey response.

The survey was conducted in July and August 2000 by the ACUTA publications committee and staff. It was done in two phases. First, attendees at the annual conference were asked to complete the questionnaire on site. Second, the survey was conducted by e-mail in late August, in order to give members who had not attended the conference an opportunity to respond.

Although the survey questions were reviewed and approved by a professional research firm to ensure that they were properly written, the survey methodology would probably not pass muster as strictly scientific. Just over 200 responses were received out of more than 800 institutional members, not enough responses to prove the data statistically valid. However, the survey results did point out some interesting trends and clear opinions.

Journal of Telecommunications in Higher Education

It is apparent that the *Journal* is well read by a majority of respondents. Ten percent read it cover to cover, and another 46 percent read most of the articles. Thirty percent read two or more articles in every issue, while only 14 percent read just one or two articles.

Considering the wide variation of responsibilities and interests among our members, we are satisfied with these results.

When we began the *Journal* four years ago, one of our goals was to have ACUTA members share it with others in their institutions, including higher-level administrators and members of their own departments. All but two of the members responding to this survey reported that they share the *Journal* in some manner! Forty-eight percent route it to specific individuals, 28 percent share it with anyone who expresses an interest, and 23 percent leave the current issue on a table or counter for others. Seventy-seven percent keep past issues for future reference.

Currently, we post abstracts of *Journal* articles on the ACUTA Web site. A slight majority of readers (60 percent) would prefer that the entire *Journal* be available on the Web, and we will investigate the feasibility of doing this. We will be looking at whether to place the full content in a password-protected section of our Web site for members only or to make it accessible to the public.

A clear majority of readers appreciate and read the advertisements in the *Journal*. Not a single respondent said they felt there was too much advertising in the *Journal*. Eighty-seven percent said the amount of advertising was about right, and 13 percent said they would find more advertising useful. By policy, we limit the number of pages available for advertising to 30 percent in order to maximize the editorial quality and appearance of the *Journal* while striving to make it self-supporting.

Based on comments from survey respondents and discussion by the board, the publications committee will also be striving to include more articles on emerging technologies in the *Journal*. We will also pursue methods of making the content of our publications searchable in a more useful way for our members on the Web.

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